UNDERSTANDING WHAT VERB PHRASES AND ADJECTIVE PHRASES

HAVE IN COMMON: EVIDENCE FROM MANDARIN ALTERNATIONS

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

1sg	first person singular
3sg	third person singular
BA	functional category *ba* 把
BI	functional category *bi* 比
CL	classifier
D	determiner
EXCEED	morpheme denoting 'exceed' in comparatives
Exp	experiential aspect marker 过
Perf	perfective marker 了
POSS	possessive

ABSTRACT

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The goal of the present study is to investigates the relation between syntax and semantics. To this end, this study looks at the Mandarin verbal alternation (*ba*-construction and SVO order) and comparative alternation (transitive comparative and *bi*-comparative). In both alternations, it is observed that one variant is selective to its complement predicates.

This study proposes that the selectivity of *ba*-construction and the transitive comparative in syntax comes from the semantic *boundedness*. Specifically, the selective functional head (little-v^0 or Deg^0, respectively) is hypothesized to require its complements to be bounded, which can be encoded in various ways, such as secondary predicates or perfective marking in the verbal domain and closed scale adjectives or measure phrase in the adjectival domain. On the other hand, the SVO order and the *bi*-comparative are hypothesized to be unselective and compatible with all types of predicates.

A two-part experimental study was conducted to test the hypothesis. The judgment task elicits informants' acceptance of the alternations in a 7-point Likert scale. The comprehension task, in which participants indicate their interpretation of sentences by choosing a picture, shows that participants are sensitive to the presence of the bounded markers tested in the experiment. The results from the acceptability judgment task confirmed the hypothesis that a variant (*ba* and tran-

sitive comparative) in each alternation selects only bounded predicates, whereas the other variant (SVO order and *bi*-comparative) is unselective with regard to boundedness, as evidenced by similar acceptability ratings across the different configurations with regard to boundedness.

The results have two implications. First, boundedness shows that semantic factors may affect syntactic selection. This, in turn, suggests a tight mapping between syntax and semantics. Specifically, this study argues that boundedness is an example of how formal feature(s) of a functional category may relate to semantic behaviors. Second, the verbal and adjectival domains shows striking parallels in their syntax and semantics. The functional categories (v^0 and Deg^0) and their complements are similar in both their syntax and semantics. The present study contributes by providing a unified analysis for the cross-categorial behaviors.

1. INTRODUCTION

1.1   Motivation: the relation between meaning and structure

Linguists have long been interested in the relation between meaning and structure of sentences. Understanding the relation tells us how pieces of information are put together and how sentences are formed. Other animals do not seem to have communication systems as sophisticated as human languages. Therefore, studying the relation between meaning and structure is a study of one of the abilities that makes our species unique.

At a first glance, there are examples that suggest meaning and structure to be completely independent modules of language. There are well-formed sentences that do not seem to make much sense, such as the famous example by Chomsky:

(1)   Colorless green ideas sleep furiously.

The sentence structure of (1) obeys the general rules of English: An adverb may follow and modify the verb, a noun phrase may be modified by adjectives, and multiple adjectives can be used to describe the same noun in a noun phrase. The reason speakers might find (1) strange is that the meaning of the sentence is difficult to understand. For example, ideas typically do not have colors since they are abstract. Also, inanimate objects in general do not sleep. When an object is colorless, it is contradictory to say that it is green at the same time. By observing sentence (1), one might come to the conclusion that sentence meaning and structure are completely independent from each other.

However, there are cases that lead us to believe there are some connections between meaning and structure. Changes in sentence structure often result in subtle difference in meaning. One case of such differences is predicate alternation, which shows that some slight changes in sentence structure can systematically change the meaning of the sentence.

1.2 Predicate alternation and its significance

Consider the English alternation with *load*, as shown in (2) and (3) below:

(2)   John loaded the hay onto the trucks.

(3)   John loaded the trucks with the hay.

'Alternation' refers to sentence pairs like (2) and (3) that have similar or the same meaning(s) but differ in word order. The two sentences may be used to depict the same scenario. Note that the lexical choice (*load*, *hay* and *truck*) remains the same and the only thing that changes is the word order. The change in word order results in the contrast in entailments. However, we also observe that the two variants have different restrictions in their meaning. The follow-up sentence is felicitous with (2), but not with (3).

(4)   John loaded the hay onto the trucks, #and there is still some (hay) left.

(5)   John loaded the trucks with the hay, and there is still some (hay) left.

The contrast shows that the entailments of the two sentences are not identical. Sentence (2) does not allow the follow-up *there is still some hay left*. Anderson (1971) has coined the term 'holistic effect' and generalizes that the noun phrase closer to the verb must be taken as a whole. As a result, the follow-up in (4) is in-

felicitous, because *the hay* is closer to the verb[1]. The importance of this example is that change in sentence structure or word order sometimes reflect subtle changes in meaning. This, in turn, suggests that sentence structure and meaning are correlated. By manipulating the sentence structure, we can see how the meaning of a sentence may change according to the structure.

1.2.1 Mandarin VP alternation

Similarly, Mandarin has predicate alternations that relate to the interpretation of the sentences. Instead of the change in relative order of two noun phrases, it is the verb itself that changes the order relative to the object in Mandarin. Also similar to the English example, the Mandarin predicate alternations involve subtle change in meaning. Mandarin differs from English in that change in relative word order involves a functional category and the lexical verb or adjective, rather than between the two objects.

(6)   Zhangsan he   (guang le)   cha
       Zhangsan drink gone   Perf tea
       'Zhangsan finished drinking the tea.'

(7)   Zhangsan ba cha he   *(guang le)
       Zhangsan BA tea drink gone   Perf
       'Zhangsan finished drinking the tea.'

Sentence (6) is commonly known as the canonical SVO word order, in which the verb precedes the direct object. In (6), it does not matter whether the speaker includes a secondary predicate *guang* or a perfective marker *le*. Sentence (7) is known as the *ba*-construction. The morpheme *ba* is a functional element that occurs with transitive verbs. It is considered an non-canonical word order because

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[1]See also Beavers (2011) for a more recent discussion.

the lexical verb follows the direct object. For (7), the sentence must include the secondary predicate or the perfective marker to be acceptable. This shows that there is a correlation between the choice of sentence structure and what words must be included. There are two questions at issue: (i) why are there two variants in the word order? (ii) why are there requirements for the *ba*-construction but no restrictions for canoncial SVO? The two questions will be reformulated in section 1.3.1 below, with considerations of the comparative alternation.

The alternation between *ba*-contruction and canonical SVO order has been well-studied in the syntax-semantics in Mandarin. A long-standing debate in Mandarin syntax is how to explain the difference between the canonical Verb-Object order (6) and (7) (known as the *ba*-construction). Recent studies appear to agree that *ba* is a functional category that is only compatible with some particular type(s) of predicates, resulting in the unacceptable combinations in the *ba*-construction (Liu, 1997; Huang et al., 2009; Lipenkova, 2011).

1.2.2 Mandarin comparative alternation

Interestingly, comparative sentences in Mandarin also show an alternation pattern. English does not have a corresponding alternation pattern. Explicit comparisons with adjectives are always expressed in the same order, as shown in (8). While the phrase containing the standard of comparison *than Peter* is optional, it may never appear before the adjective. Mandarin, on the other hand, shows an alternating pattern between the adjective and the standard of comparison.

(8)   John is (*than Peter) taller (than Peter).

(9)   Zhangsan bi Lisi gao (yi-dian)
        Zhangsan BI Lisi tall a.little
        'Zhangsan is a little taller than Lisi.'   *bi*-comparative

(10)   Zhangsan gao Lisi *(yi-dian)
        Zhangsan tall Lisi a.little
        'Zhangsan is a little taller than Lisi.'   transitive comparative

In (9), the morpheme *bi* marks the comparative sentence and the measure phrase *yi-dian* (which denotes the difference between the two compared individuals) is optional. However, the 'transitive comparative' construction (10) requires the presence of *yi-dian* in the sentence. The fact that (9) allows the absence of the measure phrase (such as *yi-dian* 'a little') indicates that Mandarin comparatives do not always require a measurement. Similar to English, speakers do not have to specify the magnitude of differentiation between the two objects being compared. The requirement of a measure phrase in (10) should therefore be construction-specific. The alternation between *bi*-comparative and transitive comparative has recently gained much attention (Xiang, 2005; Erlewine, 2007; Liu, 2011). Researchers generally agree on the observation that the measure phrase is required for the transitive comparative. However, previous studies have not considered an additional restriction on the transitive comparative construction, with the exception of Xie (2014b). In (11), the adjective *man* 'full' is acceptable with or without the measure phrase *yi-dian*, but (12) is unacceptable regardless of the presence or absence of the measure phrase.

(11)   beizi bi pingzi man (yi-dian)
        cup   BI bottle full a.little
        'The cup is a little fuller than the bottle.'   *bi*-comparative

(12)   *beizi man pingzi (yi-dian)
        cup   full bottle a.little
        Intended: 'The cup is a little fuller than the bottle.' transitive comparative

Briefly, the distinction between adjectives like *gao* 'tall' and *full* 'full' lies in their different scale structure (Kennedy & McNally, 2005). A more lengthy explanation is required for the distinction between scale structures of the adjectives. This will be addressed in chapter 3.

This study attempts to analyze the comparative alternation and the VP alternation under a common framework. Before we leap to the common framework, we need to provide descriptively adequate accounts for each of the two alternations. The following section states the research questions that are tested in the present study.

1.3 Scope of Study

1.3.1 Research Questions

The goal of this dissertation is to provide an account for the alternations in Mandarin VP alternation in (6)/(7) and comparative alternation in (9)/(10). The theoretical issue is whether the alternation shows a systematic correlation between sentence structure and meaning. Specifically, this dissertation tackles the following problems:

1. How can we explain the different restrictions on the use of the canonical SVO word order and the *ba*-construction?

2. How can we explain the different restrictions on the use of the transitive comparative and the *bi*-comparative?

3. What do these two alternations (and their differences) help us understand about how syntax and semantics work together?

4. Do these alternations share a common underlying thread?

1.3.2 Selectional differences

The research questions 1 and 2 are of the same nature. In each alternation, the two variants show differences in the types of predicates that are acceptable. That is, the more restricted variants (*ba*-construction for verbal predicates and transitive comparative for comparatives) are more selective than the other alternative variants. To account for the parallel constrast (i.e. the verbal and adjectival domains differ in the same way), this study advocates a view that Mandarin functional categories are sensitive to boundedness of the lexical predicates. The variety of acceptable sentences is a reflection of different manifestations of the same notion of *boundedness*.

Briefly speaking, boundedness refers to the presence/absence of the endpoint of a scale. Section 2.6 of the literature review will provide more details on how boundedness is manifested in English and Mandarin and justify boundedness as a proper explanation for the behaviors of verbal and adjectival predicates independently.

1.3.3 Semantically-constrained syntax

As mentioned at the beginning of this chapter, this study investigates how semantics may affect syntactic behaviors. Under the minimalist program (Chomsky, 1995), syntactic behaviors are often explained theory-internally by formal features, such features are often assumed to have their origin from interpretable semantic components of morphemes. The present study builds on this idea and tests whether (at least some) syntactic features may find their roots in semantics. The question at hand is why some predicates are not allowed in certain sentence types (e.g. bare verbs without *guang* or *le* in sentence (7)).

Since the choice of sentence structure clearly correlates to the different meanings that are possible for the respective structures, research question 3 asks whether semantics can be taken as a driving force for syntactic operations. The answer to question 3 would, in a broader sense, contribute to the discussion about the relation between syntax and semantics.

To test this hypothesis, an experimental study is designed to see whether the use of certain boundedness markers would contribute to the (un)acceptability of sentences in the two alternations. By using a combination of comprehension task and acceptability judgment, this study links the semantics of several markers (which are hypothesized to denote boundedness) to the acceptability pattern of the variants in the VP and comparative altenations.

1.3.4 Cross-categorial similarity

With the notion of boundedness in verbal and adjectival predicates independently motivated, research question 4 asks whether it is feasible to unify the two domains.

If the answers to the first three research questions are positive, a consequence is that the two domains, events and properties, are similar in terms of their syntax and semantics. It would be interesting to see if there is a particular reason for the similarities, because such a reason may reveal how human language organizes information into syntactic structure.

Recent studies show that it is a common phenomenon that different syntactic categories display similar behaviors (Filip, 2001; Stabler & Keenan, 2003; Champollion, 2010; Wilbur et al., 2012; Wellwood, 2015). Put differently, the question asks what is the origin of the similarities. The results will demonstrate that the categories are in fact similar.

1.4 Main claim: boundedness across categories

The goal of this study is to capture the observations about the two alternations discussed above. This study proposes a tight mapping between syntax and semantics and hypothesizes a boundedness contraint as an underlying common thread between these two alternations. The obligatory elements in the *ba*-construction and the transitive comparative denote boundedness to the predicate. In a more concrete way, the boundedness of verbal predicates would be manifested as the endpoint of an event. For comparatives, boundedness would mean specifying the magnitude of difference in comparison. The boundedness constraint is proposed to be active in both verbal and adjectival domains and force the functional categories (*ba* and transitive comparative) to select bounded predicates.

1.4.1 Verbal alternation: The *ba*-construction selects bounded predicates

In the verbal domain, I propose that boundedness is the reason why the *ba*-construction is unacceptable without the secondary predicate and the perfective marker, as shown in (7) above. In other words, the *ba*-construction is predicted to be acceptable, as long as there is at least one boundedness marker. On the other hand, the canonical SVO order is not subject to the boundedness constraint. Therefore, SVO sentences are predicted to be compatible with all predicates, regardless of the presence/absence of the secondary predicate or perfective marker.

In order to test the hypothesis, this study uses a two-part experiment. The comprehension task provides support that the secondary predicates and the perfective marker are the source of different interpretations for the boundedness of the predicates. By asking partipants to choose a picture that best matches the

sentence stimuli, the task elicits participants' interpretation of the sentences. The judgment task obtains acceptability data about which types of sentences are more acceptable. By contrasting the acceptability ratings of these constructions, the experimental results confirm the hypothesis that *ba* sentences without a bounded predicate receive lower ratings in the acceptability judgment task.

1.4.2 Comparative alternation: The transitive comparative selects bounded predicates

In the adjectival domain, the comparative alternation shows a similar pattern that bounded predicates are preferred in the transitive comparatives. The *bi*-comparatives are predicted to be unselective with respect to the adjectival predicates, analogous to the SVO word order with verb phrases.

Parallel to the VP alternation, the hypothesis regarding the comparative alternation is tested in the same experimental paradigm: The *bi*- and transitive comparative constructions are tested with their boundedness manipulated, such as the presence/absence of the measure phrase or the scale structure of the adjectives. The experimental results show that the transitive comparative is more acceptable with a measure phrase in combination with an open-scale adjective. Chapter 3 provides the details involving the interaction between the two factors of boundedness.

1.5 Contributions of this study

1.5.1 Experimental study on Mandarin alternations

The present study uses an experiment to elicit speakers' acceptability and comprehension of target sentences. There are cases where speakers do not agree on

the acceptability or interpretation of certain sentences. The experiment systematically controls the variables involved, such as the use of secondary predicates or perfective markers. Instead of asking the participants directly whether they prefer the inclusion of a certain word in the constructions, as is typical in informal grammaticality judgment settings, controlled experiments can better be examined because of the inclusion of multiple informants and the quantitative nature, by various techniques such as randomizing the items and using filler items.

The *ba*-construction is among the most well-studied sentence type in Mandarin, but there are no previous experimental studies focusing on the construction. The comparative constructions are also studied through a purely theoretical approach. The present study contributes empirical data for these constructions with a controlled experiment.

1.5.2   Similar behavior across categories

Previous studies on Mandarin have not made direct comparision between the VP alternations and the comparative alternation. This study contributes by showing, with experimental data, that boundedness can capture the alternations in the two domains.

This novel account is a unification of verbal and adjectival predications. The proposed unified structure subsumes the syntax-semantics of predications in different domains. This provides a simpler theory that accounts for a larger set of language data, which provides accurate and efficient teaching guidelines for learners. Previous accounts are primarily based on word order and do not show a systematic correspondence between syntax and semantics. This study will show a tight mapping between syntax and semantics in both verbal and adjectival domains.

1.6 Organization of dissertation

The first three chapters review previous studies that are related to several topics: **Chapter 2** discusses previous analyses of verbal predicates in Mandarin. **Chapter 3** discusses the analyses of comparatives. **Chapter 4** discusses the cross-categorial behaviors in other languages and constructions. Based on the discussion of the literature, **chapter 5** formulates the hypothesis of the study, namely the *boundedness constraint*. The constraint is independently motivated for each of the verbal and adjectival domains. In addition, the cross-categorial behaviors in the verbal and adjectival domains suggest that there is a connection between the domains. The immediate predictions from the hypothesis are also provided in this chapter.

Chapter 6 describes the experimental study that tests the boundedness hypothesis. The experimental study consists of two parts: an acceptability judgment task and a comprehension task. Details such as participants, experimental procedures and the stimuli are provided in the chapter.

The results in **chapter 7** confirm the boundedness hypothesis in the controlled experiments. **Chapter 8** discusses the experimental results and interprets the results for Mandarin syntax and semantics. In **chapter 9**, the theoretical implications are discussed in several aspects. The results suggest that semantics has an effect on the formal features in syntax, which in turn affects the selectional criteria of certain syntactic functions and the surface word order. Because of the similarity across verbs and adjectives, this study also discusses the issue of universality of syntactic categories and argues that separate categories of verbs and adjectives are necessary in explaining the empirical data, despite the similarities in syntax and semantics.

2. ALTERNATION IN VP: THE *BA*-CONSTRUCTION AND VP

The goal of this dissertation is to provide an account for the alternations in Mandarin verbal and adjectival predicates. In this chapter, I introduce data and previous analyses on the verbal alternation. The next chapter will discuss adjectival predicates and the comparative alternation. Lastly, works on homomorphic analyses across syntactic categories will be discussed in chapter 4. These chapters will provide a theoretical basis for the cross categorial approach adopted in this study.

In the verbal domain, Mandarin observes a predicate alternation as illustrated by the following pair:

(1)   Zhangsan da po   le   zhe ge huaping
       Zhangsan hit break Perf this Clf vase
       'Zhangsan broke this vase.'

(2)   Zhangsan ba zhe ge huaping da po   le
       Zhangsan BA this Clf vase   hit break Perf
       'Zhangsan broke this vase.'

Sentence (1) demonstrates the canonical SVO word order in Mandarin. Sentence (2) is called the *ba*-construction, where the morpheme *ba* appears immediately after the subject and before the object, and the verb comes after the object, i.e. a S-*ba*-O-V word order. However, this alternation does not apply to all predicates.

(3)   Zhangsan kanjian le   zhe ge huaping
       Zhangsan see   Perf this Clf vase
       'Zhangsan saw this vase.'

(4)   *Zhangsan ba zhe ge huaping kanjian le
      Zhangsan   BA this Clf vase   see   Perf
      Indended: 'Zhangsan saw this vase.'

The observation here is that the SVO word order allows most predicates[1], whereas the *ba*-construction does not. The problem is manifested in two inter-related questions: What is the nature of *ba*, syntactically and semantically? Why are some predicates unacceptable with *ba*, as we see in (4)?

   To answer these questions, I will first further describe the restrictions of the *ba*-construction, then review several analyses.

2.1   Restrictions on the *ba*-construction

   The *ba*-construction is not compatible with all verbal predicates. There are several restrictions:

(5)   Restrictions of the *ba*-construction

      1.**VP transitivity**: the verbal predicate must be transitive;

      2.**NP specificity**: the theme NP is specific;

      3.**NP affectedness**: the NP following *ba* tends to be affected;

      4.**Telicity**: the predicates are telic.

First, the *ba*-construction is compatible with regular transitivity predicates and ditransitives, as shown in (2) and (6), respectively.

(6)   Zhangsan ba shu   jiao-gei Lisi le
      Zhangsan BA book give   Lisi Perf
      'Zhangsan gave the book to Lisi.'

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[1]It is rarely noted in the literature that some predicates seem to always cooccur with *ba*-construction. This will be further discussed later in this section.

Except for the first restriction, not all scholars agree on these restrictions. While the following restrictions hold for most case, there are, arguably, counterexamples to these observations.

Secondly, the NP following *ba* is always specific. The specificity of the NP is not always shown overtly. Mandarin allows bare NP to be arguments. Without overt marking like determiners, the specificity cannot be easily judged by the presence of determiners or classifiers. Following Liu (1997), the expressions in table 2.1 in Chinese are specific.

Expressions	Examples
definite NPs	demonstrative NPs, pronouns, names
universally quantified NPs	*suoyou de* N 'all of the N', *meige* N 'every N'
most N:	*daduoshu de* N 'most N', *dabufen de* N 'most N'
some N:	*mou xie* N 'certain N'
bare numeral Det:	*liangge* N 'two N'[2]

Table 2.1: Liu (1997, p.86)'s list of specific NP in Chinese

Many configurations in table 2.1 might appear to English speakers to be generic. However, interpretations of Mandarin NPs are distributed differently from English. For instance, bare NPs can in fact be interpreted as definite, and therefore also specific. The speaker of sentence (6) above would expect the hearer to know which book is in question.

The third restriction is the affectedness of the post-*ba* NP. Affectedness refers to the change of state relative to the speaker, sentential subject or the topic in question. For instance, the vase in sentence (2) clearly undergoes a change of state. While this restriction holds for many cases, there are several counterexamples, such as (7).

(7)   Zhangsan ba shu kan wan le
       Zhangsan BA book read finish Perf

‘Zhangsan finished reading the book.’

Generally, one does not assume books to undergo any change after they are read. To maintain that all *ba* predicates involve an affected object, one would then have to reformulate affectedness in relation to the speaker, sentential subject or the topic. However, this reformulation would overgenerate and predict sentences like (4) to be acceptable. To my knowledge, previous studies have not formulated an account that can independently determine whether a predicate has an affected object without using the *ba*-construction itself as a test. Consequently, it becomes circular to claim that the theme-NP in all *ba* sentences are affected.

The fourth constraint is telicity. It is generally accepted in the literature. The examples above are all telic. However, this restriction does not cover all possible *ba* sentences, as shown in (8) and (9).

(8) wo hui yizhi ba ta zhaogu xiaqu
     1sg will always BA 3sg take.care along
     ‘I will always take care of him/her.’   (Haiyang Ai, p.c.)

(9) ta ba zhe jian shi   xiang de tai beiguan
     3sg BA this Clf matter think DE too pessimistic
     ‘S/he thinks of this matter too pessimistically.’   (Lipenkova, 2011)

Telic predicates, by definition, have natural endpoints. In example (8), *yizhi*, roughly glossed as ‘always’, explicitly says the speaker will continue the caretaking in the future. The predicate cannot be considered telic. The predicate *xiang de tai beiguan* ‘think of ... too pessimistically’ in example (9) is a stative and hence atelic. Nevertheless, these two examples are acceptable. This poses a challenge to the generalization that all *ba* sentences are telic.

2.2 No restrictions for the SVO order

Compared to the *ba*-construction, none of the four restrictions applies to canonical non-*ba* sentences.

For **VP transitivity**, since intransitive verbs do not have objects, we see SV word order with intransitive verbs, which is acceptable. That is, the non-*ba* sentences do allow intransitive predicates.

(10)   Zhangsan zou   / ku le
        Zhangsan leave   cry Perf
        'Zhangsan left/cried.'

NP specificity does not restrict the use of SVO order. Examples (11) shows a non-specific use, where one can felicitously add that 'but s/he does not know which one to buy yet'. Meanwhile, one may also follow up the same expression with 'but the pair s/he wants is sold out' in (12). This indicates that the first NP *xiezi* 'shoe' can be interpreted as specific or non-specific.

(11)   Zhangsan yao   **mai xiezi**, keshi hai mei xiang hao   mai na   yi
        Zhangsan want **buy shoe** but   still Neg think good buy which one
        shuang
        pair
        'Zhangsan wants to buy some shoes, but s/he doesn't know which pair
        to buy yet.'

(12)   Zhangsan yao   **mai xiezi**, keshi ta xiang yao de na   shuang mai
        Zhangsan want **buy shoe** but   he want need DE which pair   sell
        guang le
        out   Perf
        'Zhangsan wants to buy some shoes, but the pair s/he wants is sold out.'

As for **NP affectedness**, the SVO word order is not restricted. Examples (13) and (14) both involve traversing predicates, in which the objects are considered less affected (Beavers, 2010). Both are acceptable in the SVO order.

(13)   Zhangsan pao bu
        Zhangsan run step
        'Zhangsan runs / goes jogging.' (*habitual reading*)

(14)   Zhangsan zou guo le   zhe dao qiao
        Zhangsan walk pass Perf this Clf bridge
        'Zhangsan walked on the bridge.'

Lastly, **telicity** does not show any restriction on the SVO order. Lexical verbs in Mandarin do not inherently denote telicity. For instance, *kan* 'to look; to read' does not denote any natural endpoint. Therefore, (15) and (16) show that SVO order is compatible with atelic predicates.

(15)   Zhangsan zhengzai kan shu
        Zhangsan currently read book
        'Zhangsan is reading.'

(16)   Zhangsan kan le   liang xiaoshi de shu
        Zhangsan read Perf two   hour   DE book
        'Zhangsan read(s) for two hours.'

Examples (10)–(16) above show that the use of SVO order is not restricted by the four restrictions for the *ba*-construction. In what follows, I review four lines of research on the *ba*-construction.

2.3   The disposal and affectedness accounts

Earlier works (Chao, 1968; Li & Thompson, 1981) make observations that VPs following *ba* often have affected objects.

Hashimoto-Yue (1971) describes the object of *ba* predicates as highly transitive and affected. In the *ba*-construction, the subject typically exerts some influence over the object (hence 'disposal'). While disposal/ affectedness accounts do explain more canonical utterances, but there is a wide range of sentences that do not involve affected objects, such as (8) and (9) discussed above.

2.4 The syntactic account

One line of research analyzes *ba* as a Case assigner (Li, 2006; Huang et al., 2009). This view of *ba* is shown in (17):

(17)   (Huang et al., 2009, p.178, 195)
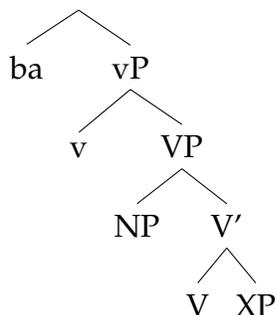
The head *ba* is a functional category which selects a verbal predicate as its complement, and assigns the Nominative Case to its specifier. However, this is not to claim that the subject of the *ba*-construction is always the agent.

Huang et al. (2009)'s argument for a *ba*-phrase (in addition to vP) is based on adverb placement. The following sentences are from Huang et al. (2009, examples 59a–60b).

(18)   wo **xiaoxin-de** ba beizi na   gei ta
        1sg **carefully**   BA cup take to 3sg
        'I gave the cup to him carefully.'

(19)   wo ba beizi **xiaoxin-de** na   gei ta
         1sg BA cup **carefully**   take to 3sg
         'I gave the cup to him carefully.'

(20)   wo **xiaoxin-de** na   beizi gei ta
         1sg **carefully**   take cup to 3sg
         'I gave the cup to him carefully.'

(21)   *wo na   beizi **xiaoxin-de** gei ta
         1sg take cup **carefully**   to 3sg
         Intended: 'I gave the cup to him carefully.'

Example (21) is unacceptable; Huang et al. (2009) take the constrast between *ba* and SVO above as evidence that the landing site of the main verb *na* 'take' in (21) is structurally lower than the base-generated position of *ba*. Huang et al. (2009) do not assign a category for *ba* in general terms and simply place *ba* in a position higher than the lexical verb projection. In the next section, we will see more data with non-agentive *ba* sentences discussed by Sybesma (1999).

While this syntactic account explains the syntactic distribution of *ba* with the same underlying structure, it does not naturally capture the difference in restriction with regard to the internal argument, i.e. the second and the third restrictions in (5). The take-home message of this subsection is that syntax alone cannot explain the altenation phenomenon of this study.

Based on similar adverb placement evidence, Ernst (2010) also proposes the following structure for the *ba*-construction, where *ba* heads the projection above the vP.

(22)   [IP DP Infl [BaP BA [vP DP [v' v VP]]]]   (Ernst, 2010, p.190)

Ernst also points out that there is no generally accepted 'dividing lines between light verbs, auxiliary verbs, serial verbs, and the like'. This means the two word

orders reflect realizations of different functional heads. Recent studies (Sundaresan, 2013; Varley, 2013; Travis, 2013) have suggested that the little-vP or VoiceP is internally complex and should therefore be split into more fine-grained projections, in ways similar to split-CP or split-IP proposals. This split-vP position will be further discussed in chapter 9.

Taking the split-vP and the adverb placement facts together, one can see that *ba* represents a projection of different size than the init^0 represented by the raised lexical verb in the SVO order. That is, the adverb placement facts in Huang et al. (2009) do not refute the analysis that *ba* and SVO order show alternations of the same underlying structure. More explicitly, if one no longer assumes that there may only be one vP projection, the analysis in Huang et al. (2009) and Ernst (2010) would be compatible with the analysis that *ba* is also in the vP domain.

2.5   Verbal and causation acounts

Bender (2000) analyzes *ba* as a grammaticalized verb. I argue that this claim cannot be taken literally, because such a claim would be falsified by data below, where A-not-A question and immediate precedence to aspect marking are considered typical tests for verbhood. Since these examples are both unacceptable, one cannot consider *ba* as a regular lexical verb.

(23) *ta ba bu ba na ge pinggwo chi le
      3sg BA Neg BA this Clf apple   eat Perf
      Intended: 'Has he eaten the apple?'   (A-not-A question)

(24) *ta ba le   na ge pinggwo (chi)
      3sg BA Perf this Clf apple   eat
      Intended: 'He ate the apple.'   (Immediate precedence of aspect)

Bender (2000)'s account is implemented in LFG, which does not make distinctions in functional categories such as T(ense), Asp(ect) or little-v. In her analysis, object NP and the lexical VP are the complements of ba^3, hence a flat structure [*ba* NP VP]. This is in essense an embedded VP-shell structure. Therefore, Bender (2000)'s verbal account should best be translated into the little-v analysis in minimalist terminology.

Sybesma (1992, 1999) also analyzes *ba* as a functional head that takes VP as a complement. Sybesma's Postverbal Constraint suggests that there is only one phrasal position after the verbal head in the *ba*-construction. However, the problem of the Posterverbal Constraint is that it does not apply for the double object construction. This requires a stipulation that *ba* takes a small clause complement where the post-*ba* NP is analyzed as a VP-internal subject, and the Postverbal constraint applies to such subject NPs. On the other hand, double object constructions have two 'genuine' objects, therefore they are not targets of the postverbal constraint.

Based on examples like (25), Sybesma (1999) proposes the causation analysis, in which *ba* is the head of a causation phrase.

(25)   zhe jian shi   ba Zhangsan ku lei   le
             this Clf matter BA Zhangsan cry tired Perf
             'This matter got Zhangsan tired from crying'   (Sybesma, 1999)

The inanimate subject 'this matter' in (25) clearly has no volition and hence cannot be an agent. This shows that the NP before *ba* is not necessarily an agent. Sybesma argues that the post-*ba* phrase is a small clause VP dominated by a CAUS-phrase:

---

[3] Bender (2000) actually claims that *ba* takes three arguments: the subject before *ba*, the internal argument and the final VP.

(26)

CAUSP
  Subject   CAUS'
         CAUS (*ba*)   VP
                   NP   V'
                      V   XP

Structure (26) shows that *ba* is the head of CAUSP, and that its VP complement includes the causee as the specifier of VP. This is compatible with Ramchand (2008)'s account of event structure, in that the initiator does not have to be the agent, and nevertheless has the nominative case. Ramchand claims that an event should be analyzed in the following structure:

(27)

initP
  $init^0$ procP
          $proc^0$ resP
                 res^0 Rheme
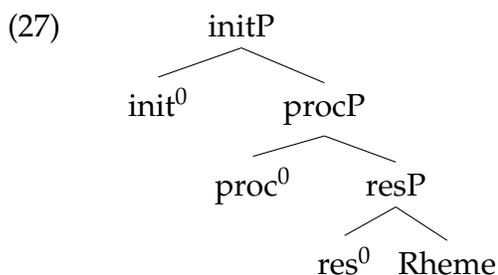
What (27) means for this study is that *ba* should then be analyzed as $init^0$. This $init^0$ analysis does not contradict Sybesma (1999)'s CAUS^0 analysis. The head *ba* cannot be used as external causation, but only be used as internal causation, which Ramchand (2008) argues is init^0 (see Travis (2010) for the discussion on internal causation). For example, (28) is acceptable, but (29) is not. The intended meaning of (29) can only be expressed in (30), which uses *rang* as the marker of external causation.

(28)   Zhangsan ba pingguo chi le
        Zhangsan BA apple   eat Perf
        'Zhangsan ate the apple.'

(29)   *Lisi ba Zhangsan ba pingguo chi le
         Lisi BA Zhangsan BA apple   eat Perf
         Intended: 'Lisi let Zhangsan ate the apple.'

(30)   Lisi rang Zhangsan ba pingguo chi le
         Lisi let   Zhangsan BA apple   eat Perf
         'Lisi let Zhangsan ate the apple.'

(31)   Lisi {*ba / rang} Zhangsan rang pingguo chi le
         Lisi BA   let   Zhangsan let   apple   eat Perf
         'Lisi let Zhangsan let the apple be eaten.'

Contrasting (30) and (31), we see that *rang* 'let' can be iterated, which is predicted for external causation. Also, in (31), the sentence does not entail that Zhangsan ate the apple (pragmatically, one might prefer that Zhangsan did not, but s/he allowed somebody else eat the apple). In (31), only *rang*, but not *ba* can occur after the causer *Lisi*. This shows that *rang* is in fact a marker for external causation. The examples (28)–(31) together show that *ba* cannot be iterated and must not be an external causation. This in turn indicates that *ba* should be analyzed as init^0.

The head status of *ba* is sometimes challenged by A-not-A questions. A-not-A questions are generally assumed to indicate head movement from V^0 or v^0 to C^0 (which hosts the element A). The observation is that *ba* cannot occur in A-not-A questions, despite being the head of the vP. However, Tian (2006, 2007) notes that A-not-A question is not an effective diagnostic of verbhood. Tian gives the following examples to show the use of A-not-A questions in verbs and other elements:

(32)   Tom lai   bu   lai?
         Tom come Neg come
         'Is Tom coming?'   (element A as a verb) (Tian, 2007, 10)

(33)   ni   gen bu gen ta jianghua bu zhongyao.
         You to   Neg to   3SG speak   Neg important

'It's not important whether you want to talk to him/her.'   (A as a

preposition)

(34)   jintian tianqi   hao bu   hao
        today weather good Neg good
        'Is today's weather good?'   (A as an adjective)

(35)   Tom pao de kuai bu   kuai?
        Tom run de fast Neg fast
        'Does Tom run fast?'   (A as an adverb)

Tian's argument shows that A-not-A question is not effective in testing verbhood. Examples above show that other elements, such as prepositions, adjectives and adverbs, can occur in A-not-A questions. Consequently, using A-not-A question as a diagnostic would wrongly predict other elements to be considered as verbs. Also, the A-not-A test for *ba* is problematic in that it fails to predict example (36). Bender (2000) provides this example (36), where *ba* can in fact appear in A-not-A pattern [4].

(36)   ta ba bu   ba fangzi chai   le   wusuowei
        3sg BA Neg BA house demolish Perf not.matter
        'It doesn't matter whether s/he demolishes the house.'   (Bender, 2000,

        p.121)

(36) is different from other A-not-A questions in that it is not a matrix question, but an embedded sentence. The observation that (36) is acceptable shows that

---

[4]Note that *ba*-question (36) is in fact embedded and irrealis. The corresponding question is illicit:
(i) *ta   ba   bu   ba   fangzi   chai   le   ?
      3sg   BA   Neg   BA   house   demolish   Perf
      Intended: 'Did s/he demolishes the house?'
Interestingly, there seems to be a parallel 'suspension of the rules' in the restriction of positive morpheme *hen*. This will be further discussed in section 3.3 about Liu (2011)'s observation of the null positive morpheme in adjectival predicates.
(ii) [Zhangsan   yaoshi   (hen)   gao   dehua   ,]   Lisi   jiu   bu   ai
       Zhangsan   if   very   tall   PRT   Lisi   then   not   short
       'If Zhangsan is (very) tall, then Lisi is not short.' Conditionals (Grano, 2011, ex. 11d)

A-not-A questions are not homogeneous. From the data given above, embedded *ba*-sentences can in fact occur in A-not-A questions. At the beginning of this section, unacceptable examples like (23) indicates that *ba* should not be treated as a regular lexical verb. Considering a wider range of the data, one can see that A-not-A questions appear to accept lexical categories that are clearly non-verbs, in addition to lexical verbs. Therefore, Tian (2007) and Bender (2000) taken together, one can conclude that A-not-A question is not a reliable indicator for the movement restriction or syntactic category of *ba*.

2.6 The boundedness account

Another line of research looks at the *ba*-construction from a semantic point of view. Instead of looking only at the syntactic distribution and constituency of *ba* sentences, this line of research focuses on how semantic factors affect the acceptability of the *ba*-construction.

2.6.1 Boundedness as a formal feature

Liu (1997)[5] explains the restriction of *ba* based on the aspect properties, à la Smith (1991). Liu focuses on two requirements of the *ba*-construction: (i) the *ba* NP must be specific and (ii) there must be some element other than the basic verb in the predicate (Liu, 1997, example 6). We have already discussed requirement (i) earlier in section 2.1. Requirement (ii) is the counterpart of Sybesma (1999)'s postverbal constraint. Liu lists several expressions that belong to 'some other element other than basic verb', which are required by *ba*:

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[5]In a more recent study, Liao (2005) makes a similar proposal. Since only the abstract of the presentation is available, this study is unable to discuss Liao (2005) in detail.

(37)   Liu (1997)'s boundedness elements[6]

- V + resultative verb complement

- V + *de* (resultative)

- V + retained object

- V + perfective marker *-le*

- V + PP (dative or locative)

- V + quantified phrase

- V + *yi* + V (the tentative construction)

- V + durative marker *-zhe*

- Adv + V

The notion of boundedness has been discussed in several studies for independent reasons (Thompson, 2006; Jackendoff, 1991; Vendler, 1967; Krifka, 1998). Thompson (2006) proposes that the bounded events are interpreted in the domain of the Aspect phrase in syntax. Assuming the minimalist framework (Chomsky, 1995) and the feature-checking mechanism, Thompson claims that the [bounded] feature in the Asp^0 requires a matching [bounded] feature for the sentence to be grammatical. For instance, English sentence (38) can be explained by structure (39).

---

[6]A discussion on each of these elements is beyond the scope of this study. For Liu, the shared property between the two requirements is boundedness. That is, the VP in *ba*-sentences describes a bounded predicate. The list (37) contains mostly postverbal elements, except for the last item Adverb + V combination. This example is important, because it shows that the boundedness element does not necessarily appear postverbally. As long as the adverb used denotes some sort of boundary (often temporal, but not exclusively so), the sentence would be acceptable. Therefore, there is no apparent reason to believe that the preverbal adverbs constitute a problem for Liu's analysis. Since this particular type introduces a confound (i.e. the relative position to the lexical verb), I will leave it for future studies. Among other elements in (37), one might wonder how *zhe* sentences, which are analyzed as durative, can be bounded. Sentences with *zhe* are analyzed as the realization of a resultant state. Since this is best explained in the context of property predicates of minimal standards, we will come back to this issue in chapter 3 on adjectives and chapter 9 on the implications of this study. Liu's formulation is largely adopted in this study.

(38)   Mary ate the apple. Thompson (2006)

(39)   ...AspP (Thompson, 2006, #14)

```
        ...AspP
       /      \
  DP_bounded   Asp'
              /    \
       Asp_bounded  vP
                   /  \
                  v   VP
```
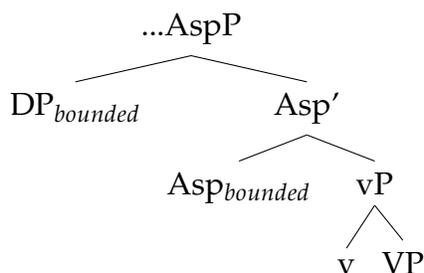
Since the object 'the apple' in (38) is definite and therefore bounded, the interpretable [bounded] feature in the VP checks with the uniterpretable features in AspP, when the object raises to Spec,AspP (the sentence subject 'Mary' is not shown in (39)).

Thompson's proposal can be extended to the bounded requirement of *ba* in Mandarin. Recall that Ernst (2010) points out Mandarin and English do not share the same configuration in the division of labor between Aspect and light verb domains. Since there is no one-to-one mapping between morpheme and projections, a morpheme may 'span' over multiple projections, as proposed by nanosyntax researchers (Starke, 2009, 2010; Fábregas, 2009). Structure (40) shows a functional hierarchy with fine-grained Asp and little-v projections.

(40)

$$
\begin{array}{c}
\text{Asp}^1\text{P} \\
\diagup \quad \diagdown \\
\text{Asp}^1 \qquad \text{Asp}^2\text{P} \\
\qquad \diagup \quad \diagdown \\
\qquad \text{Asp}^2 \qquad \text{v}^1\text{P} \\
\qquad\qquad \diagup \quad \diagdown \\
\qquad\qquad \text{v}^1 \qquad \text{v}^2\text{P} \\
\qquad\qquad\qquad \diagup \quad \diagdown \\
\qquad\qquad\qquad \text{v}^2 \qquad \text{v}^3\text{P} \\
\qquad\qquad\qquad\qquad \diagup \quad \diagdown \\
\qquad\qquad\qquad\qquad \text{v}^3 \quad \text{VP}
\end{array}
$$
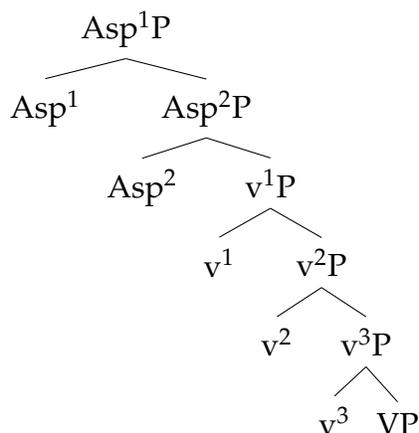
Cross-linguistically, language A may have one morpheme representing Asp^1-Asp^2, while language B represents the same projections with two separate morphemes. Within a language, functional category A may express Asp^1-Asp^2-v^1, functional category B v^2-v^3, and functional category C v^1-v^2. Spanning predicts that, with this inventory, morpheme C would be incompatible with A or B, because C competes with both A and B in the v^2 projection. On the other hand, morphemes A and B may cooccur, since they do not compete for the functional projection v^2.

To account for the facts about Mandarin *ba*, the adjustment to be made here is that *ba* represents a higher functional projection close to AspP and within the vP in syntax. Structure (41) shows such a configuration where *ba* heads one of the several little-v projections.

(41)

$$Asp^1P$$
$$Asp^1 \quad Asp^2P$$
$$Asp^2 \quad v^1P$$
$$v^1 \quad v^2P$$
$$ba \quad v^2 \quad v^3P$$
$$v^3 \quad VP$$
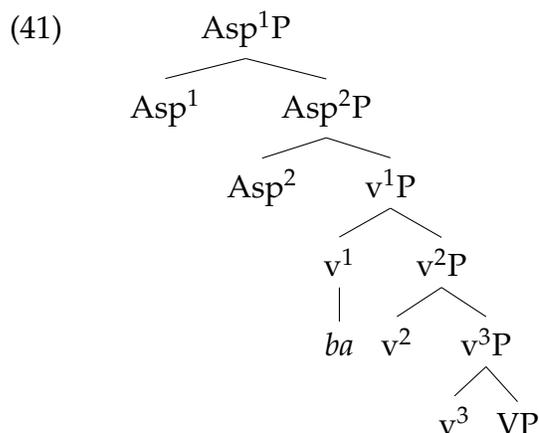
This is congruent with the analysis in Ernst (2010) and Huang et al. (2009) that Mandarin *ba* is higher than regular light verbs, and also the claim in Thompson (2006) that the boundedness can be expressed by Aspect elements.

2.6.2 Formal semantics of *ba*

In addition to the syntax of morphemes denoting boundedness, recent research also proposes how the semantic boundedness may be represented. Lipenkova (2011) proposes the following denotation for *ba* in (42)[7], capturing the same intuition about boundedness in Liu (1997) and Thompson (2006).

(42) $\llbracket ba \rrbracket = \lambda P_{\langle e, \langle e, t \rangle \rangle} \lambda y \lambda x \lambda s \lambda d \lambda e. P(x)(y)(e) \wedge scale(s)(e) \wedge extent(s)(d)(e)$

According to Lipenkova, the morpheme *ba* 'requires an event argument *e*, a scale *s* that is associated with this event and a difference value *d* on this scale'. Denotation (42) asserts that *ba* is saturated by scalar events, the scalar property of which may appear in various forms. For example, lexical verbs that do not have inherent degree or scalar arguments, such as *qi* 'ride' in (43), must be supported by a resultative morpheme, denoting a degree, which is on the scale that maps to the event.

(43) Aming ba zixingche qi   huai   le
      Aming ba bike   ride broken Perf
      'Aming rode the bike and as a result it broke.' (Lipenkova, 2011, example

      31)

Sentences like (43) have often been explained in terms of affectedness, since the object 'bike' does indeed undergo change. The contribution of Lipenkova's scalar theory is that it further explains how some unaffected objects can appear in the *ba*-construction. Example (9) is repeated below as (44):

---

[7]It is important to note that the semantic approach and the syntactic approach are not mutually exclusive. Also, since Lipenkova (2011) uses a HPSG implementation, this study does not discuss the details of the implementation.

(44)   ta ba zhe jian shi   xiang de tai beiguan
        3sg BA this Clf matter think DE too pessimistic
        'S/he thinks of this matter too pessimistically.'   (Lipenkova, 2011)

The direct object *zhe jian shi* 'this matter' is clearly unaffected, because the lexical verb is a psych-verb. In Lipenkova's approach, whether or not the object is affected is irrelevant. The requirement of *ba* can be satisfied by the scalar property of the event *xiang* 'think; consider' imposed by *tai beiguan* 'too pessimistically'. In (45), the thinking event *e* associates with the scale of being pessimistic. The differential function specifies that the actual degree of pessimism is larger than acceptable the degree of pessimism (denoted by $d_{accept.}$), such that the evaluation of 'too pessimistic' is true. The degree specification is therefore considered to license the acceptability of the *ba*-construction.

(45) $\exists e \ldots scale'(pessimistic)(e) \wedge extent'(pessimistic)(diff(d_{accept.})(d_{too}))(e)$

      (Lipenkova, 2011, example 36)

It is also important to note that (44) is unacceptable without the degree modifier *tai* 'too', as shown in (46). Besides, (47) shows that other degree modifiers such as *hen* 'very' or *feichang* 'extremely' can satistfy the same constraint. This further confirms that the specification of degree (rather than simply the scale of pessimism) is crucial for the acceptability of *ba*.

(46)   ta ba zhe jian shi   xiang de *(tai) beiguan
        3sg BA this Clf matter think DE too   pessimistic
        'S/he thinks of this matter too pessimistically.'

(47)   ta ba zhe jian shi   xiang de { hen / feichang } beiguan
        3sg BA this Clf matter think DE very   extremely pessimistic
        'S/he thinks of this matter very/extremely pessimistically.'

Peck et al. (2013); Lin & Peck (2011) formulate Mandarin complex predicates (i.e. multi-morphemic verbal predicates) in scalar terms. Specifically, their analysis shows that scalar Mandarin verbal predicates (e.g. degree achievement verbs) are often expressed by multi-morphemic expressions. The scalar analysis captures the composition of 'eat' and 'stuffed' in (48), where 'eat' denotes the process/action and 'stuffed' denotes the result.

(48) ta   chi huai le   duzi
      she eat bad Perf stomach
      'She got a runny stool as a result of eating.'   (Peck et al., 2013, p.676)

This provides independent support for the boundedness analysis of *ba* as an explanation to the postverbal constraint. Since Mandarin always use multi-morphemic expressions to denote scalar properties of events, the traditional postverbal constraint can be treated as a by-product of the boundedness requirement and the way multi-morphemic expressions are generally formed: The *ba*-construction requires bounded predicates (regardless of the number of elements after the verb), but bounded event predicates are often formed with multi-morpheme expressions, where additional elements are found after the lexical verb. The two factors confound and create the postverbal constraint.

2.7 Interim summary for the *ba*-construction

This section has described the constraints of the *ba*-construction (section 2.1) and the canonical SVO order (2.2) and reviewed the previous studies on the *ba*-construction:

- While the disposal and affectedness accounts (2.3) explains typical *ba*-sentences, in which the object undergoes some changes, there are counterexamples that these accounts do not explain.

- The syntactic accounts (sections 2.4 and 2.5) provide sufficient description, where *ba* is analyzed as a functional head that immediately dominates the traditional little-v head. However, it cannot sufficiently explain the constraints on the predicates.

- The boundedness account in section 2.6 builds on the syntactic/causation accounts. In addition, the boundedness account unifies the semantic restrictions in various forms, such as telicity and degree achievement predicates.

3. ALTERNATION IN AP: TWO TYPES OF COMPARATIVES

Similar to the VP, comparatives in Mandarin displays an alternation between two possible word orders. This study refers to (1) as the *bi*-comparative and (2) as the transitive comparative, following Erlewine (2007)'s terminology.

(1) Zhangsan bi Lisi gao yi-dian
     Zhangsan BI Lisi tall a.little
     'Zhangsan is a little taller than Lisi.'

(2) Zhangsan gao Lisi yidian
     Zhangsan tall Lisi a.little
     'Zhangsan is a little taller than Lisi.'

This section first describes the relevant facts about the restrictions of the two comparative forms in (1) and (2). I will then outline the basics about the adjectival predication, including positive adjectives, *bi*-comparatives and transitive comparatives, and discuss previous studies on these constructions. Towards the end, I will also discuss other complex forms of the comparatives in Mandarin.

3.1   Restrictions on transitive comparatives

Similar to the alternation in verbal predicates, the alternation in comparatives also shows a contrast in their compatibilities with predicates. Like the canonical SVO order for VP, the *bi*-comparative does not show any restriction on the lexical adjectives. On the other hand, the transitive comparative, similar to the *ba*-construction, is not compatible with all verbal predicates. On the other hand, the *bi*-comparative is not subject to any of the restrictions in (3):

(3)   Constraints on the transitive comparative:

- the adjective must be monosyllabic

- there must be a measure phrase

- the adjectives are often open scale (à la Kennedy & McNally (2005))

- for some speakers, the transitive comparative in general is degraded, compared to the *bi*-comparative.

First, the transitive comparative does not allow bisyllabic adjectives, as reported in several previous studies (Xiang, 2005; Erlewine, 2007; Grano & Kennedy, 2012). Sentences like (4) are unacceptable. The only acceptable option is sentence (5).

(4)   *Zhangsan congming Lisi hen duo
        Zhangsan smart   Lisi very much
        Intended: 'Zhangsan is much smarter than Lisi.'

(5)   Zhangsan bi Lisi congming hen duo
        Zhangsan BI Lisi smart   very much
        'Zhangsan is much smarter than Lisi.'

This is a somewhat arbitary restriction. While the majority of bisyllabic adjectives in Mandarin are parallel compounds, these compounds do not appear to form a particular syntactic or semantic class. The acceptability seems to be based entirely on the number of syllables. For instance, when describing a person who is tall, *gao* and *gao-da* are often interchangeable, i.e. they share the same meaning.

(6)   Zhangsan hen gao
        Zhangsan very tall
        'Zhangsan is very tall.'

(7)   Zhangsan hen gao-da
         Zhangsan very tall-big
         'Zhangsan is very tall.'

However, only (8), but not (9) is acceptable in the transitive comparative.

(8)   Zhangsan gao Lisi hen duo
         Zhangsan tall Lisi very much
         'Zhangsan is much taller than Lisi.'

(9)   *Zhangsan gao-da Lisi hen duo
         Zhangsan   tall-big Lisi very much
         Intended: 'Zhangsan is much taller than Lisi.'

Because of this restriction, the experimental study reported here does not include any bisyllabic or multi-syllabic adjectives.

The second restriction is that there must be a measure phrase (Schwarzschild & Wilkinson, 2002), such as *yi-dian* 'a little' or *hen duo* 'very much'. Without the measure phrase, the transitive comparative is unacceptable, as shown in (10). The same constraint does not apply for the *bi*-comparative in (11).

(10)   Zhangsan gao Lisi *(hen duo)
         Zhangsan tall Lisi very   much
         'Zhangsan is much taller than Lisi.' (obligatory measure phrase)

(11)   Zhangsan bi Lisi gao (hen duo)
         Zhangsan BI Lisi tall very much
         'Zhangsan is much taller than Lisi.'

This restriction is also noted in Grano & Kennedy (2012). The term 'measure phrase' covers the context-appropriate phrases that denote the difference. 'Context-appropriate' means the measurement (e.g. '2 inches') should match the dimension (e.g. height or length) in the comparison. Alternatively, one can use terms like

liang bei 'two times' or *yi ban* 'a half'. In most cases, vague measurements like *yi-dian* 'a little' (literally 'one bit') or *hen duo* 'very much[1]' are acceptable.

The third restriction is related to the scales denoted by the adjectives. Adjectives in closed scale, such as *zhi* 'straight' or *man* 'full', do not appear to occur in transitive comparatives. Examples like (12) and (13) are less acceptable.

(12) ??beizi man pingzi yi-dian
     cup   full bottle a.little
     'The cup is fuller than the bottle.'

(13) ??zhuozi xin yizi yi-dian
     table   new chair a.little
     'The table is newer than the chair.'

Kennedy & McNally (2005) proposes the scalar structure typology in (14), where D stands for degrees, R represents the ordering relation, and △ for the dimension for the scale. The square brackets to the right of D ("[" and "]") denote boundaries of a scale. The parentheses denote open scales. For Kennedy & McNally, p.354, "(s)cales that are open on the lower end include all of those degrees that approach the limit of 0 but lack a degree whose value is less than that of all the others in the set; scales that are closed on the lower end include such a minimal value, equal to 0.".

(14)
$\langle$ D(0,1), R, △$\rangle$ (TOTALLY) OPEN SCALE, e.g. *tall/short*

$\langle$ D[0,1), R, △$\rangle$ LOWER CLOSED SCALE, e.g. *loud/quiet*

$\langle$ D(0,1], R, △$\rangle$ UPPER CLOSED SCALE, e.g. *pure/impure*

$\langle$ D[0,1], R, △$\rangle$ (TOTALLY) CLOSED SCALE, e.g. *full/empty*

Kennedy & McNally (2005, p.354-355)

---

[1]Mandarin does not morphologically distinguish count and mass nouns. This means that *duo* can be used with individuated or unindividuated nouns (e.g. *hen duo shui* 'much water' or *hen duo beizi* 'many cups'), while English has two separate words 'much' and 'many'.

To test which type of scalar strcture an adjective belongs to, maximality modifiers can be used. Such modifiers include *100%*, *fully* and *completely*. Only adjectives denoting a closed scale can be felicitously modified by maximality modifiers.

Scale	Adjectives
open	*100% tall / *100% short
lower closed	*100% loud / 100% quiet
upper closed	100% pure / *100% impure
closed	100% full / 100% empty

Table 3.1: Testing the scales of antonym pairs with maximality modifiers, adapted from Kennedy & McNally (2005)

In table 3.1, the pair *tall-short* is considered open, because neither of the adjectives can be modified by *100%*. Between *loud* and *quiet*, only *quiet* can be modified by *100%*, but not *loud*, the scale is therefore said to be lower closed. The same applies to upper closed scales and closed scales. The same modification test works for Mandarin adjectives, and the acceptability pattern is exactly the same as English (Table 3.2).

Scale	Adjectives
open	*100% *gao* 'tall' / *100% *ai* 'short'
lower closed	*100% *chao* 'loud' / 100% *jing* 'quiet'
upper closed	100% *chun jing* 'pure' / *100% *bu chun jing* 'impure'
closed	100% *man* 'full' / 100% *kong* 'empty'

Table 3.2: Testing Mandarin antonym pairs with maximality modifiers

When Mandarin adjectives like *man* 'full' and *xin* 'new' show a boundary (as evidenced by the acceptable expressions *100% man/xin* '100% full/new', *quan man* 'totally full' and *quan xin* 'totally new') they appear to systematically resist transitive comparatives. Note that (15) and (17) are illicit, but their *bi*-comparative counterparts with the same adjectives are acceptable. This indicates that compar-

isons in the dimensions of 'fullness' and 'newness' are possible in the language, and that the restriction applies only to transitive comparatives.

(15)   ??beizi man pingzi yi-dian
         cup   full bottle a.little
         'The cup is fuller than the bottle.' =(12)

(16)   beizi bi pingzi man yi-dian
         cup   BI bottle full a.little
         'The cup is fuller than the bottle.'

(17)   ??zhuozi xin   yizi   yi-dian
         table   new chair a.little
         'The table is newer than the chair.' = (13)

(18)   ??zhuozi bi yizi   xin   yi-dian
         table   BI chair new a.little
         'The table is newer than the chair.'

This restriction has not been reported in previous studies. The most frequently used example in the literature is *gao* 'tall'. This is the case for most studies reported here (Xiang, 2005; Xiong, 2007; Erlewine, 2007, 2008, 2013; Liu, 2010a; Guo, 2012; Grano & Kennedy, 2012; Liu, Chi-Ming Louis, 2010; Liu, 2011). In a few cases, adjectives like *huan* 'wide' or *kaixin* 'happy' are used. Some of these studies also discuss comparatives in verbal predicates or clauses, which we will discuss separately in section 3.5. As far as adjectives goes, the lexical items are all gradable and belong to the open scale type.

A related line of research focuses on the total/partial distinction of predicates (Yoon, 1996; Rotstein & Winter, 2004; Winter, 2006). This typology of adjectives is not based on antonym pairs as in Kennedy & McNally (2005). Rather, it targets individual adjectives within a pair. Building on Yoon (1996), Rotstein & Winter

(2004) use *almost*-modification to diagnose the total/partial distinction in adjectives. If an adjective can be modified by *almost*, that adjective is considered total.

(19)   The work is almost complete / *incomplete.

(20)   The patient is almost dead / *alive.

(21)   The explanation is almost clear / *unclear. (Rotstein & Winter, 2004, p.9)

Therefore, *complete*, *dead* and *clear* are total predicates, and their respective antonyms in (19)–(21) are partial predicates. Under this distinction, the *almost* test indicates that total predicates include closed scales in Kennedy & McNally (2005)'s 4-way typology (e.g. *almost empty* and *almost full*) and the bounded adjectives in the upper bound pair (e.g. *almost pure* but **almost impure*).

Note that *almost*-modification is always allowed in comparatives. This is the case for both English and Mandarin. Take a few adjectives that typically resist *almost*-modification in their positive form:

(22)   *John is almost tall/short.   [English]

(23)   John is almost taller/shorter than Tim.

(24)   *John cha-dian (hen) gao / ai
        John almost   very   tall   short
        Intended: 'John is almost tall/short.'   [Mandarin]

(25)   John cha-dian bi Tim gao / ai
        John almost   BI Tim tall   short
        'John is almost taller/short than Tim.'

The contrast above in (22)/(23) and (24)/(25) reveals that comparatives can be modified by *almost*, despite the fact that the adjective cannot undergo *almost*-

modification on its own. This, in turn, suggests that comparatives should not be analyzed as partial predicates.

There does not seem to be any similar restriction in English, to my knowledge. The only restriction in English comparatives is gradability in general. However, adjectives in all types of scalar structures can occur in comparatives. This difference suggests that this scale structure restriction is construction-specific.

To briefly summarize the third restriction, there are at least two tests (*100%* and *almost*) that help us diagnose bounded predicates (upper bound scale and closed scale in Kennedy & McNally (2005) or total predicates in Rotstein & Winter (2004)). This study makes the observation that transitive comparatives resist bounded predicates. This novel observation is important in that the transitive comparative may be more restricted than what is commonly assumed (i.e. with regard to the presence of the measure phrase).

The fourth and last restriction is related to dialectal variation. In the pilot study (conducted prior to the study reported here , the results of which are not included)), a speaker from Taiwan expressed that the transitive comparative is not acceptable. Contrary to the consensus in the literature, the participant did not accept regular transitive comparatives like (10), regardless of the presence of measure phrases. Since this potential dialectal difference has not been reported in the literature, this study does not include data from Taiwanese speakers.

Based on these four restrictions, this study draws comparison between the transitive comparative and the *ba*-construction, which is also constrained in multiple ways. On the other hand, the *bi*-comparative is parallel to the canonical SVO word order in the verbal domain. Both constructions appear to accept predicates regardless of their boundedness[2].

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[2]This is a somewhat misleading statement. This does not mean that SVO may select all possible predicates globally. There are examples where the SVO structure is dispreferred compared to the

3.2 Restrictions on *bi*-comparatives

It is important to note that the *bi*-comparative is not restriction free. There are certain restrictions that are observed in Mandarin but not in English. For example, Erlewine (2007) reports that Mandarin comparatives do not have eqivalent of indirect comparisons like English, and there is simply no comparable translation for (26) in Mandarin:

(26)   The door is taller than it is wide.

A second restriction is that Mandarin comparatives only allow comparison between subjects, but not objects.

(27)   John likes Mary more than Peter. (*ambiguous*)

(28)   John bi Mary xihuan Peter
         Johh BI Mary like   Peter
         'John like Peter more than Mary does.' (*unambiguous*)

The English sentence (27) is ambiguous. It can refer to the comparison between the subjects (John likes Mary more than Peter likes Mary) , or between the objects (John likes Mary more than John likes Peter). However, Mandarin comparatives never allow ambiguities like (27). That is, (28) cannot mean 'John likes Mary more than he likes Peter'.

While these Mandarin-English comparisons are interesting for cross-linguistic variation, they are not crucial in contrasting the alternation in Mandarin comparatives, since all the restrictions on *bi* can also apply to transitive comparatives.

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ba-construction. Since the selection does not seem to relate to the boundedness, this study will not attempt to provide a full explanation.

3.3 Syntax-semantics of degree and scales

This section outlines a few aspects of the syntax and semantics analysis of degree and scales that are relevant for the Mandarin *bi-* and transitive comparatives. I first discuss the status of the positive degree morpheme in Mandarin, which shows the simpler case of adjectival predicates without the standard of comparison. The second part of the section will transition to the analysis of comparatives in general.

3.3.1 Positive morpheme for adjectives

Before moving on to comparatives, it is necessary to briefly discuss the more basic form of adjectival predicates, positive adjectives, as seen in (29) in Mandarin and (30) in English.

(29) Zhangsan *(hen) gao
      Zhangsan very   tall
      'Zhangsan is tall.'

(30) Zhangsan is tall.

These sentences relate a degree of a gradable scale (*height* in this case) to an individual (*Zhangsan* in this case). Unlike English, Mandarin adjectives (29) must include a degree word, such as *hen* 'very'. Independently, Mandarin does not use a copula verb like English. Negation as in (31) shows that *hen* does not function as a copula, since negation without *hen* is acceptable. Also, the use of other lexical items, such as *ting* 'fairly; rather' or *feichang* 'extremely' in (32), further supports that a degree word is needed.

(31)　　Zhangsan bu　 gao
　　　　Zhangsan Neg tall
　　　　'Zhangsan is not tall.'

(32)　　Zhangsan ting　 / feichang　 gao
　　　　Zhangsan fairly　 extremely tall
　　　　'Zhangsan is fairly tall.'

Also, the adjectival predicates can be modified by a measurement (33) and (34) or bound by wh-elements (35) and (36).

(33)　　Zhangsan is six feet tall.

(34)　　Zhangsan liu chi　gao
　　　　Zhangsan six foot tall
　　　　'Zhangsan is six feet tall.'

(35)　　How tall is Zhangsan?

(36)　　Zhangsan you　duo gao ?
　　　　Zhangsan have how tall
　　　　'How tall is Zhangsan?'

The data indicate that there is a variable in the adjective, which elements like *six feet* and *how* take scope over and provide the interpretation. Heim (2000) proposes that gradable adjectives in English denote functions of type $\langle d, et \rangle$, as shown in the denotation (37) below.

(37)　　$[\![tall]\!]_{\langle d,et \rangle} = \lambda d_d \lambda x_e.\ x$ is tall to degree d　　　　　　　Heim (2000)

In (37), $[\![tall]\!]$ denotes a function from degree to predicate. Degree words, such as *very* in English, then bind the degree variable d (subscript $_d$ indicates type $\langle d \rangle$),

providing the interpretation. Since some adjectives[3] are sensitive to contexts (e.g. the range of being tall for humans is different from that of being a building), Kennedy (2007)'s denotation of $[\![pos]\!]$ incorporates the context-sensitivity.

(38) $[\![pos]\!] = \lambda g \lambda x . g(x) > s(g)$ $\qquad$ Kennedy (2007)

Unlike the optional English 'very', Mandarin always requires a degree morpheme in predicative use. This obligatory status suggests that Mandarin degree words might not be adjuncts or adverbials. Grano (2011) analyzes the degree morpheme as a head taking the adjective phrase as its complement. Semantically, *hen* takes a gradable adjective phrase as its complement and returns a predicate. The difference between (38) and (39) is not crucial. As Grano notes, the degree variable formulation can be recast in Kennedy (2007)'s term.

(39) $\qquad$ TP $\qquad\qquad\qquad$ (Grano, 2011, example 62c)

$\qquad\qquad$ T $\qquad$ DegP$_{\langle et \rangle}$

$\qquad\qquad$ Deg$_{\langle\langle d,et \rangle,\langle et \rangle\rangle}$ $\quad$ AP$_{\langle d,et \rangle}$

$\qquad\qquad\qquad$ *hen* $\qquad\qquad$ *gao*
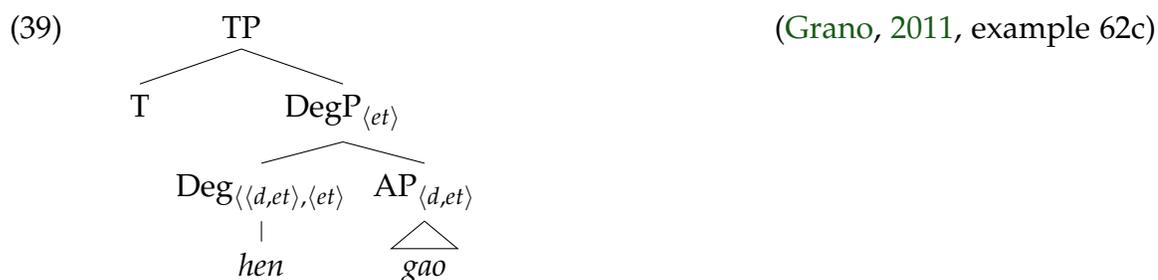
Several researchers note that the Deg^0 can take a null form under certain situations, in addition to *hen* 'very' or other degree words (Huang, 2006; Gu, 2008; Liu, 2010b; Grano, 2011). Recall that adjectival predicates in general require a degree word, as shown in (29). Liu (2011) argues along with Kennedy (2005, 2007) that *hen* is an overt counterpart of the null *pos* morpheme in Mandarin. Liu then posits an operator that has access to the predicate and the null Deg^0.

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[3]This is related to the absolute/relative distinction of gradable adjectives. The present study will not discuss the distinction between absolute and relative gradable adjectives, both are subject to contextual information, see Kim et al. (2014); Rullmann (1995).

The three different proposals by Huang (2006); Gu (2008); Liu (2011) are not crucial to the present study, since the boundedness constraint proposed here is not contingent on the relation between the degree variable and what governs the choice between *hen* and the null morpheme. Also, given that the data presented in this chapter and the experimental study do not test these claims, we will not attempt to evaluate these proposals here. The take-home message from this line of research on *pos* is that there is independently a need to posit a degree function to account for the relevant data in adjectival predications.

Conceptually, the positive adjectives are parallel to intransitive verbs. Both are predicates that can be saturated by one individual. The positive degree morpheme can be seen as a parallel to the little-v in the event domain. Grano (2011) advocates a view that positive adjectives, dominated by TP in syntax, behave similarly to verbs and their projections (see the "T[+V] constraint" in Grano (2011)). Erlewine (2007) holds a similar view by stating that the *bi* in comparatives is verbal in nature, which explains the VP comparatives. We will further motivate this idea in chapter 4 on the homomorphic approach to account for such parallel behaviors across categories.

3.3.2 The measure phrase

The discussion on transitive comparatives has mentioned that the measure phrase (like *yi-dian* 'a little; literally one bit') is obligatory. English adjective predications and comparatives allow, but do not, require the measure phrase.

(40)   John is (six feet) tall.

(41)   John is (a little/ two inches) taller than Mary.

The measure phrase is typically analyzed as an adjunct of DegP. The DegP itself can either be analyzed as the phrase dominating the AdjP (Morzycki, 2006), or as an adjunct to the AdjP (Cresswell, 1976; Corver, 2009; Schwarzschild, 2005). The examples (40) and (41) also show that measure phrases can be found in both predicative adjectives and comparatives. In most cases, comparatives can felicitously take measure phrases, as long as the measurement is contextually and ontologically compatible with the dimension. For example, height and length can be measured by 'inches' or 'centimeters', and temperature can be measured by 'degree Celsius/Fahrenheit'. However, there seem to be restrictions on predicative adjectives taking measure phrases. For example, 'six feet tall' is acceptable, but '20 degree warm' is not acceptable in English[4]. Following Schwarzschild (2005), this study assumes that measure phrases are adjuncts. In the following discussion about *bi*-comparatives and transitive comparatives, we will also see that the adjunction analysis of measure phrases is congruent with the Mandarin data.

### 3.4   *Bi*-comparatives and transitive comparatives

This section focuses on previous studies about the two types of comparatives in Mandarin. The *bi*-comparative has been analyzed as the head of DegP that dominates the AdjP (Xiang, 2005; Erlewine, 2007; Xiong, 2007), as the head of PP (as 'prepositional subordinator') that adjoins to the AdjP (Lin, 2009; Guo, 2012), or in a 'hybrid' analysis by Liu (2011).

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[4]This study does not address this puzzle, interested readers can refer to Schwarzschild (2005).

3.4.1 Head analysis of Degree

Xiang (2005) posits a DegP-shell structure in (43), where a lower DegP is headed by an exceed morpheme, which licenses the differential function / measure phrase as its complement.

(42)   Zhangsan bi Lisi gao liang-cun
        Zhangsan BI Lisi tall two-inches
        'Zhangsan is two inches taller than Lisi.'
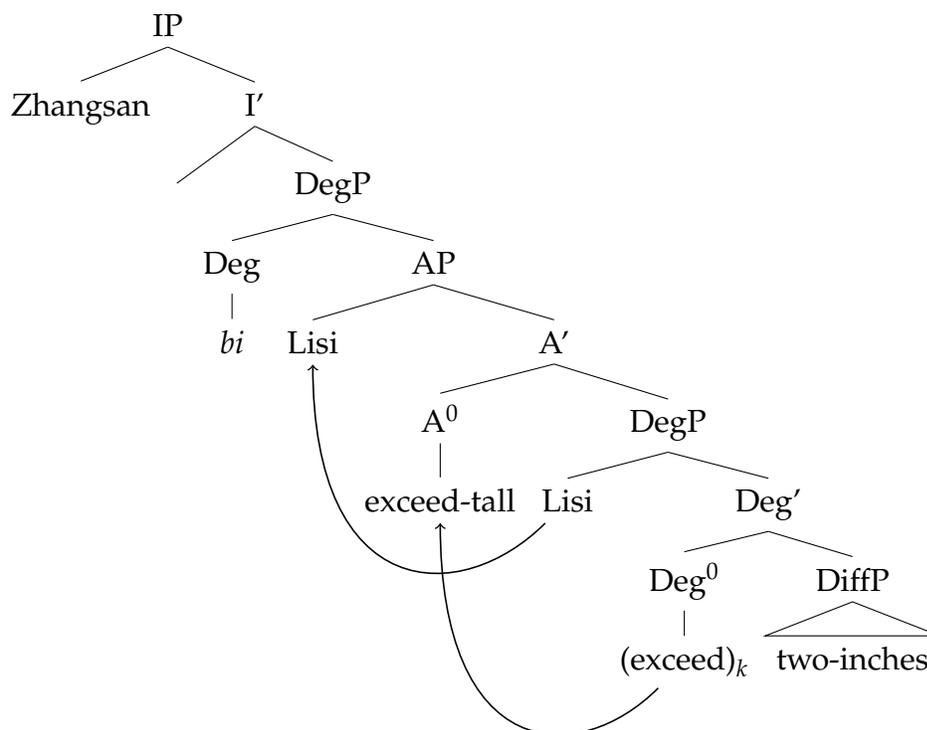
(43)

Regarding the treatment of the measure phrase, Xiang's motivation for the complement DiffP analysis is to draw parallels between *bi*-comparative and transitive comparative (Xiang, 2005, p.193). Xiang's DiffP is then an optional argument in *bi*-comparative, but obligatory in transitive comparative. Xiang attributes this difference to the idiosyncratic nature of argument structure. The measure phrase is obligatory in the transitive comparative. It is uncommon that a sen-

tence structure forces the predicate to realize all its arguments. This would be left unexplained, if one resorts to optionality of argument realization.

Also, Xiang (2005) aims to achieve a unified analysis between *bi* and transitive comparatives. The minimal difference between *bi* and transitive comparatives is that the latter observes head movement of the adjective from A^0 to Deg^0. The unified structure for *bi*-comparative and transitive comparative is a desirable outcome. However, the formulation of AP and its complements overgenerates transitive comparatives and wrongly predicts sentences with closed scale adjectives to be acceptable. Recall restriction 3 in section 3.1, which observes that closed scale adjectives like *man* 'full' or *xin* 'new' do not occur in transitives comparatives. Following (43), adjectives like *man* 'full' or *xin* 'new' are predicted to undergo head movement from A^0 to the higher Deg^0. The sentences, however, turn out to be unacceptable.

(44) ??beizi man pingzi yi-dian
      cup   full bottle a.little
      'The cup is fuller than the bottle.' =(12) & (15)

There are other criticisms of Xiang (2005)'s head analysis. Su (2012) makes two arguments against Xiang (2005)'s head-analysis of *bi* and the unified account between *bi* and transitive comparatives. The following paragraphs clarify that these criticisms do not contradict Xiang (2005)'s head analysis. A closer look at these potential problems, in fact, further the supports head analysis for *bi* and transitive comparatives.

First, according to Su (2012), the head analysis of *bi* in Xiang (2005) fails to explain why (46) is not acceptable.

(45) Zhangsan bi Lisi haiyao gao san   gongfen
      Zhangsan BI Lisi even   tall three centimeters

'Zhangsan is even taller than Lisi by three centimeters.'

(46)   *Zhangsan gao Lisi haiyao san   gongfen
        Zhangsan   tall Lisi even   three centimeters
        Intended: 'Zhangsan is even taller than Lisi by three centimeters.'

(Adapted from Su (2012)[5])

According to Su, the pair (45)/(46) indicates that *bi* and transitive comparatives must not share the same structure. Lin (2009) raises a similar challenge to the head analysis. However, neither Su nor Lin elaborate on the analysis of *haiyao* (or *hai*) 'even' in Mandarin. Assuming that focus particles like 'even' are syntactically adverbs, this study treat *haiyao* as an adverb too. Analyzing *haiyao* as an adverb does not force us to treat transitive adjectives differently. Similar to the contrast between *ba*-construction and the canonical SVO order, where Huang et al. (2009) show that *ba* heads a phrase above vP, it is possible that the DegP can be split into two layers, and the adjective moves from its base-generated position to the lower Deg^0. This formulation would explain why the focus adverb *haiyao* only occurs on the left of the adjective. In Erlewine (2007)'s analysis of verbal *bi*-comparatives, he labels the phrase headed by *bi* as vP, which dominates another vP that hosts [voice] features. This is also congruent with the structure of *ba*-construction provided by Huang et al. (2009) in the little-v domain (see structure (17) in the discussion of *ba*).

An alternative analysis of *haiyao* is to treat it as an affix. This way, *haiyao* is essentially a phonetic realization of *exceed* in (43), in which case Xiang (2005) can in fact predict the contrast in (45) and (46). Under this analysis, since *haiyao* is a prefix, it must move with the head *gao*, as in the structure (47).

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[5]This study differs from Su (2012) and glosses *haiyao* as 'even; even still', rather than 'much'. This makes explicit why the unacceptability of (46) is similar to (12) and (13), where non-open scale adjectives like 'full' or 'new' cannot occur in transitive comparatives.
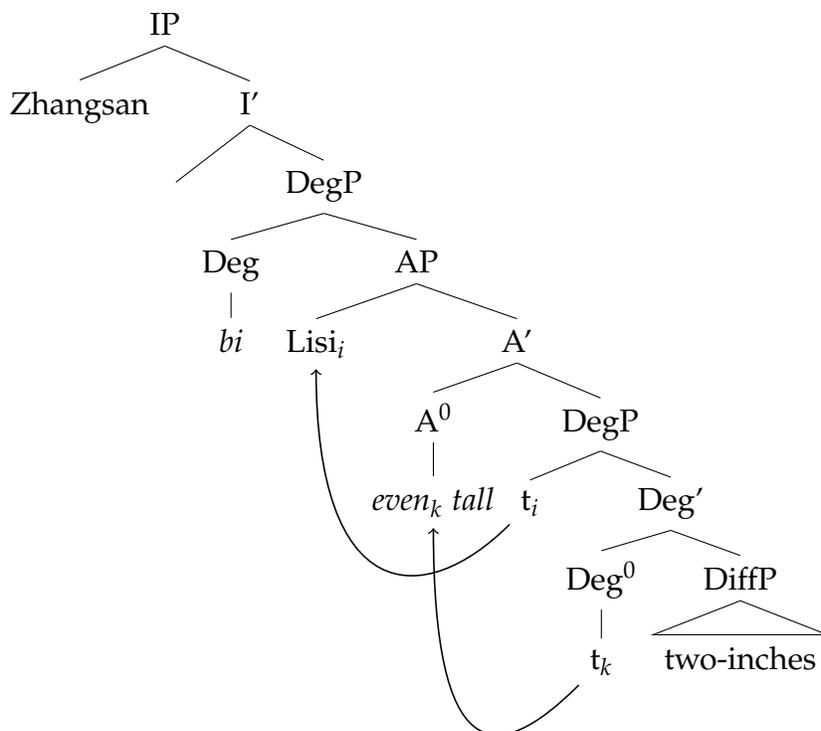
(47)

Also, the affixal analysis of *haiyao* correctly predicts that (48) is acceptable. This indicates that the use of *haiyao* 'even' does not disprove Xiang (2005)'s head analysis for *bi* and transitive comparatives.

(48)   Zhangsan haiyao gao Lisi san   gongfen
        Zhangsan even   tall Lisi three centimeters
        'Zhangsan is even taller than Lisi by three centimeters.'

Moreover, Su cites examples (49) and (50) in Sixian Hakka, a variation of Hakka spoken in Taiwan, taken from Su (2012), and argues that the head analysis does not explain why *go* 'exceed' must be present.

(49)   Zhangsan bi   Lisi *(go)   pang
        Zhangsan than Lisi exceed fat
        'Zhangsan is fatter than Lisi.'   (Sixian Hakka)

(50)   Zhangsan bi   Lisi *(go)   cungmin
       Zhangsan than Lisi exceed smart
       'Zhangsan is smarter than Lisi.'   (Sixian Hakka)

Since (49) and (50) are in a different language, one cannot assume that *go* 'exceed' would behave the same way as its Mandarin counterpart *geng* 'exceed; more'. The data seems to suggest that *go* in Sixian Hakka is simply obligatory, whereas Mandarin *geng* is optional in *bi*-comparative. The head analysis in (43) in fact predicts that the exceed morpheme can be found in the lower Degree head[6].

Erlewine (2007) also proposes a head analysis for *bi*-comparatives. His study focuses on the properties of comparisons between verbal predicates, such as 'John likes Peter more than Mary', rather than nominals and their associated degrees. It will be discussed separately in section 3.5.

Grano & Kennedy (2012) focus on the transitive comparatives and suggest that transitive and *bi*-comparatives share the same underlying structure (51).

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[6]In addition, Su (2012) cites Mok (1998) that Cantonese observes the same word order in (49) and (50). This does not appear to be the case in the language or Mok's data, since Cantonese has only the equivalent of transitive comparative and no counterpart of the *bi*-comparatives. In fact, Lam (2014) follows Grano & Kennedy (2012) and provides a head analysis to *gwo3* comparatives, which includes the *exceed* morpheme, *gwo3*, as a suffix that attaches to the adjectival head. Su (2012, p.10) notes in footnote 5 that transitive comparative in Sixian Hakka takes the form *ngo go pang ng* 'I exceed fat you'. This indicates that the adjective in transitive comparative occurs before the standard of comparison. This, in turn, suggests that *go* should be analyzed as a prefix that moves with the adjective, under the same mechanism discussed in Lam (2014), minimally different in that Cantonese *gwo3* is a suffix.

(51)

```
              DegP
            /      \
          Deg      AP
                 /    \
               DP      A'
               |      /   \
             Lisi    A     MP
                   /   \    |
              A_COMP   Af  liang cun
                |      |
               gao     μ
```
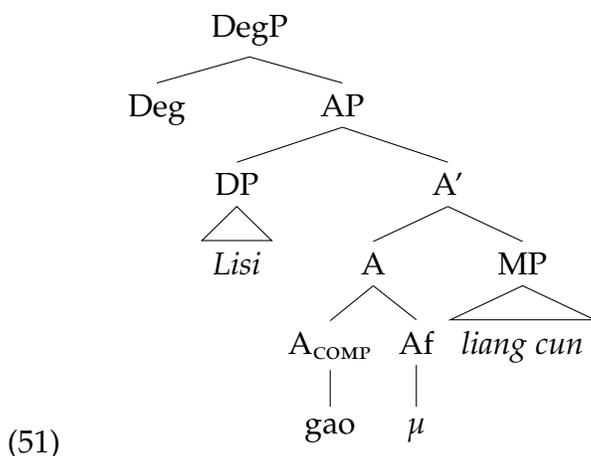
In (51), the Deg^0 can be filled by either *bi* or the raised adjective head *gao* from A$_{\text{COMP}}$, hence a uniform analysis to the two types of comparatives.

The comparative affix μ is an important feature of Grano & Kennedy (2012)'s analysis. It replaces the lower DegP in Xiang (2005), which is motivated to licence the measure phrase. The affixal μ exerts the same effect by altering the licensing of the A^0, which consists of two morphemes, namely A$_{\text{COMP}}$ and μ. Recall the optional morpheme 'exceed' discussed in Su, which always immediately follows the adjective, either in *bi* or transitive comparatives. The Mandarin counterpart of this optional morpheme is *chu* 'exceed'. By positing that *chu* is a phonetic realization of μ, this affixal analysis straightforwardly captures the meaning and distribution of *chu* 'exceed' (see footnote 30 in Grano & Kennedy (2012)). In addition, Grano & Kennedy also show that this formulation explains the ambiguity of example (52).

(52)   Zhangsan gao liang mi
        Zhangsan tall two   meter
        'Zhangsan is two meters tall.'

        OR 'Zhangsan is two meters taller (than some salient individual).'

(Grano & Kennedy, 2012, ex.78)

When μ is silent, the hearer does not know whether the sentence is comparative or positive, since there is no overt standard of comparison. As a result, the measure phrase 'two meter' can be interpreted either as the measurement of the height of the subject *Zhangsan*, or as the difference between *Zhangsan* and an implied standard[7]. When μ is phonetically realized by Mandarin *chu*, similar to (49) in Sixian Hakka, the sentence is no longer ambiguous and bears only the comparative interpretation.

Grano & Kennedy (2012) have solved the problem we observed in Xiang (2005)'s analysis, namely the unmotivated lower DegP that governs the presence of the measure phrase / DiffP. There is an issue that Grano & Kennedy (2012) have only briefly mentioned, namely the restriction of transitive comparatives in relation to the scalar structure (e.g. *man* 'full' does not undergo head raising to Deg^0 from A^0.) If all adjectives in Mandarin are represented by A_{COMP} in Mandarin, then *man* 'full' (or other closed scale and upper-bound scale predicates) should be allowed to occur in transitive comparatives, which is not the case from the empirical data. One might argue that *man* is not comparable in Mandarin. This argument, however, does not hold, because *man* is acceptable in *bi*-comparatives. The controlled experimental study in chapters 7 and 8 will further show that there is a systematic difference between adjectives with different scale structures. Consequently, one cannot claim that *man* cannot occur in comparatives. The affixal account alone does not explain why transitive comparatives are more restrictive in the choice of adjectives than *bi*-comparatives.

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[7]The example given by Grano & Kennedy might be improved by using more plausible situations. For example, the ambiguity can be better illustrated if we use buildings to be the objects being compared, rather than humans. It is important to note that the ambiguity can be observed with other adjectives and nouns, though the acceptability might be limited by plausibility of the situation.

3.4.2 Adjunct analysis of *bi*-comparatives

The other theory of *bi*-comparatives is the adjunct analysis (Lin, 2009; Liu, 2011; Guo, 2012). What is common in these three studies is that they all have the functional Degree projection that adjoins to the AP, producing a variation of the following configuration:

(53)

```
              AP
           /      \
        DegP       A′
       /    \     /   \
  bi standard A/A′   DiffP
                    /     \
               Measure phrase
```
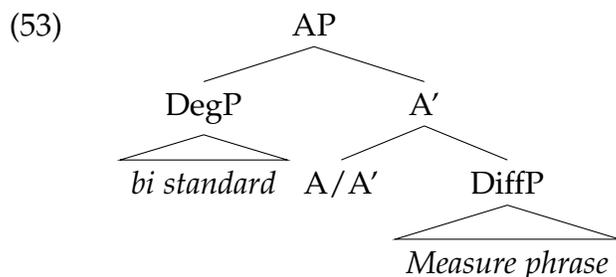
All three studies treat *bi* and transitive comparatives differently. Essentially, the adjunct analysis equals different analyses between *bi* and transitives, though this does not have to be the case in theory.

This section argues that there are problems with the adjunct analysis and that a head analysis would provide proper explanations to the data.

Lin (2009) argues for an analysis where the DegP (which can take DegP complement iteratively) adjoins to the AP. Lin (2009)'s first argument against the head analysis is that coordination (54) test indicates *bi* forms a constituent with the following DP.

(54) Zhangsan bi Lisi huozhe bi   Wangwu gao
      Zhangsan BI Lisi or   Comp Wangwu tall
      'Zhangsan is taller than Lisi or (than) Wangwu.'

Liu (2011, 2014), following Lin (2009), suggests that *bi* and the standard of comparison should form a constituent and argues that the *bi* should be analyzed as

the head of an adjunct to the predicate (either AP or VP). They take (55) as clear indication for the '*bi*-standard' sequence to be a constituent.

(55)　ta-de shengao bi wo haiyao ai,　bi Yaoming na　geng　　shi
　　　his　height　BI 1sg even　short BI Yaoming then even-more is
　　　tian　　cha di　　yuan le
　　　heaven differ ground far　SFP
　　　'He is much shorter than I am. If compared with Yaoming, his height is even like the distance between the heaven and the ground.'　(Lin, 2009, example (32))

However, the coordination data can be explained in terms of ellipsis, which is a defense of the head analysis provided by Xiang (2005). Lin (2009) also admits that this is reasonable, though not strong enough an example for him to refute the adjunct analysis. The ellipsis analysis is commonly adopted in a wide variety of data. Consider example (56) in English.

(56)　John **should and must** find a new apartment.

If example (56) does not force us to treat functional categories like *should* and *must* as adjuncts, then one might need stronger tests and evidence to show that *bi* and the following DP should form a constituent. The problem is that *bi* and the following DP do not undergo topic/focus movements. If the sequence *bi*–DP forms a constituent, (57) should be acceptable, but this prediction is not borne out.

(57)　bi *(qi)　Lisi, Zhangsan gao
　　　BI Pred Lisi　Zhangsan tall
　　　Intended: 'Compared to Lisi, Zhangsan is taller.'

The obligatory use of *qi* shows that *bi* here is better analyzed as a lexical verb. In other uses, *qi* and *qi lai* often mark the inception of events. Crucially, (57) indicates that *bi*–DP do not undergo topicalization/focalization like other adjuncts. For instance, Ernst (2010) provided many examples where adjuncts of various kinds can be found at different levels.

(58)   Lisi (**qingqingde**) ba zhuozi (**qingqingde**) qiao-le   yixia
        Lisi lightly   BA table   lightly   knock-PRF once
        'Lisi lightly knocked once on the table.'   Ernst (2010, p.180)

Also, this is not exclusive for VPs. Comparatives and adjectival predicates observe the same phenomenon.

(59)   (dagai)   Zhangsan (dagai)   bi Lisi (***dagai**) gao
        probably Zhangsan probably BI Lisi probably tall
        'Zhangsan probably is taller than Lisi.'

The important data point is that *dagai* 'probably' cannot appear between *bi Lisi* and *gao* (or with any conjunctions). Contrasting the acceptability of *dagai* immediately before *bi Lisi*, one can see that *bi Lisi* should not be considered an adjunct[8].

In addition, since *dagai bi Lisi, Zhangsan gao* is also ill-formed, this study takes it as indication that *dagai* 'probably' cannot adjoin to the DegP adjunct under the adjunct analysis of *bi-Lisi*. If both *dagai* and *bi Lisi* were both adjuncts, then we would be left with the puzzle that there is a strict order between adjuncts in Mandarin. However, we do not see such a restriction between two adjuncts, more specifically between an AdvP and a PP in Mandarin.

---

[8]In addition, I argue for a head analysis for *bi*, which maintains that *bi* and the following NP do not form a constituent. However, the facts about adverb placement do not indicate the (non-)constituency of *bi* and NP

(60)   Zhangsan **zuotian**   **gen**   **Lisi** qu le   jichang
                Zhangsan yesterday with Lisi go Perf airport
                'Zhangsan went to the airport with Lisi yesterday.'

(61)   Zhangsan **gen**   **Lisi zuotian**   qu le   jichang
                Zhangsan with Lisi yesterday go Perf airport
   'Zhangsan went to the airport with Lisi yesterday.' =(60)

Both (60) and (61) are acceptable. This indicates that there is in fact no restriction on ordering between two adjuncts in Mandarin. This, in turn, leads us to question whether *bi* and the standard should be treated as an adjunct.

Based on the observation that transitive comparatives have constraints additional to *bi*-comparatives, Lin (2009) concludes that *bi*-comparatives would require a different structure independently. As a result, Lin does not consider the possibility of a common structure between the two types of comparatives. However, as the lack of ordering among multiple adjuncts show, analyzing *bi* and the standard as an adjunct runs into a problem in explaining why adverbials cannot occur between the standard of comparison and the adjective, as shown in (59) above.

Liu (2011) proposes a similar adjunct analysis, where he gives different treatments for clausal and phrasal comparatives. Since his arguments on adjunct analysis are in the same line with Lin (2009) and Liu focuses on the difference between clausal and phrasal comparatives, the details of his analysis will not be discussed here.

Guo (2012) also proposes an adjunct analysis for *bi*-comparatives that contains three projections. Sentence (62) would be analyzed as (63).

(62)   Zhangsan bi Lisi gao (chu)   liang-gong-fen
                Zhangsan BI Lisi tall exceed 2-cm
                'Zhangsan is 2 cm taller than Lisi.'

(63)

```
                         TP
                    /          \
            Zhangsan_k          T'
                           /         \
                          T           PredP
                          |         /       \
                          Ø   t_k          Pred'
                                       /          \
                                    Pred           DegP
                                     |         /        \
                                     Ø       StndP       Deg'
                                            /     \     /      \
                                          bi Lisi  Deg        DegP
                                                   |       /        \
                                              gao_i-CHU_j  DiffP      Deg'
                                                            |       /      \
                                                           2-cm    Deg      AP
                                                                   |        |
                                                                 [t_i t_j]  t_i
```
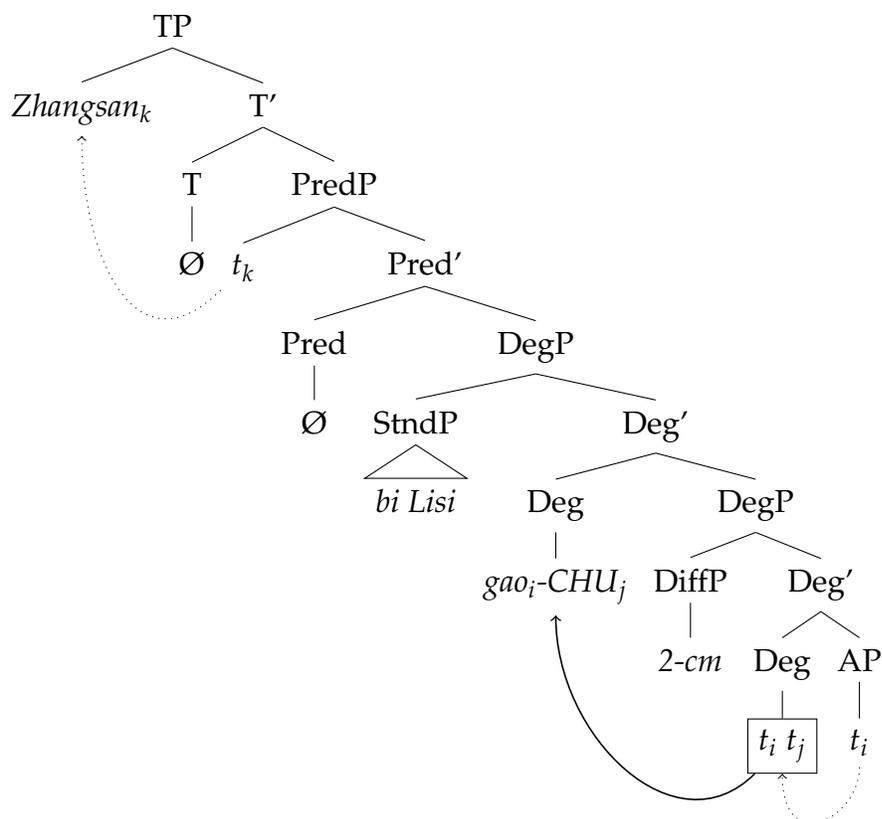
In (63), *bi* heads a prepositional phrase that introduces the standard of comparison (*Lisi*). The morpheme *chu* 'exceed' is optional in all *bi*-comparatives. Guo's analysis takes *chu* as an affix that moves together with the adjective, such as *gao* 'tall', to the higher Deg^0. The solid line shows that *gao* and *chu* move together from lower Deg to higher Deg.

The head movement from A^0 to the lower Deg^0 is motivated by feature checking under the minimalist framework (Chomsky, 1995; den Dikken et al., 2010). Based on the meaning 'exceed', Guo (2012) argues that the overt degree marker *chu* or its silent counterpart (equivalent of Grano & Kennedy (2012)'s affixal μ) carries an interpretable [Grd] (gradable) feature. The uninterpretable [CPR] (comparative) feature attracts the head of the lower DegP to raise to the higher Deg^0, which reflects the surface word order in (62) / (63).

Guo (2012) does not consider that the transitive comparative and *bi*-comparative might share the same structure. Within the lower DegP, the DiffP is simply optional in all cases (as in all *bi*-comparatives). For transitive comparatives, the DiffP would have to be always present as a construction-specific rule. The optional measure phrase in *bi*-comparatives is therefore not an issue for her analysis. While this treatment is descriptively adequate, it does not capture the reason behind the requirement of measure phrases for transitive comparatives. As argued above in the discussion of Grano & Kennedy (2012), the measure phrase is best analyzed as an adjunct on the right.

The A^0-to-(lower)Deg^0 head movement accounts for Adj-*chu* comparatives (as shown in (63), also note that *bi* is an adjunct in this analysis). In addition, this would also explain the distribution of *chu* in transitive comparatives. Essentially, Guo's [lower DegP + AP] analysis is another implementation of the affixal treatment of *chu* in Grano & Kennedy (2012). Grano & Kennedy (2012)'s account that takes μ as a affix with A_{COMP} can be problematic, because the difference between the A^0 with and without the affix (especially when the affix μ can be silent) is difficult to test. On the other hand, Guo (2012)'s movement analysis is motivated by the semantic difference between plain adjectives and degree predicates (e.g. an adjunct like '5 inches' would denote measurement for the former, and differential function for the latter).

Furthermore, the morpheme *geng* 'even more' shows support to Guo's [lower DegP + AP] analysis over Grano & Kennedy (2012)'s affix analysis. Sentences (64) and (65) show that *geng* can occur only with *bi*-comparative, but not with transitive comparative.

(64)   Zhangsan bi Lisi geng gao
         Zhangsan BI Lisi more tall
         'Zhangsan is taller than Lisi.'

(65) *Zhangsan (geng) gao Lisi (geng) yi-dian
Zhangsan more Lisi tall more a.little
Intended: 'Zhangsan is a little taller than Lisi.'

To extend the affix analysis, one might analyze *geng* as a prefix (the similar way that *chu* would be a suffix). However, (65) shows that *geng* cannot occur in front of the raised adjective *gao*. Also, since *geng* cannot appear immediately after *Lisi*, one may not analyze *geng* as an adverbial that adjoins to the left within the AP. Guo (2012)'s [lowerDeg + AP] proposal can handle the unacceptability of (65), with the additional benefit of a uniform analysis for *bi* and transitive comparative.

(66)

```
                    DegP
                 ┌────┴────┐
            Zhangsan      Deg′
                       ┌───┴───┐
                    Deg⁰      DegP
                      │    ┌────┴────┐
                     bi   Lisi     Deg′
                               ┌────┴────┐
                             Deg⁰       AP
                               │        △
                             geng      gao
```
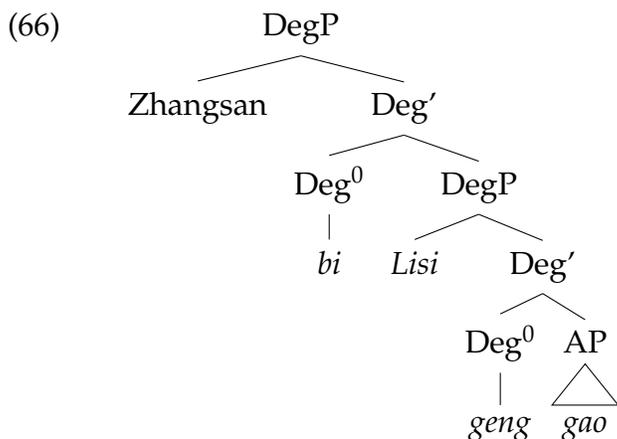
This extension of Guo's account demonstrates that the [lower DegP + AP] analysis is able to explain a greater variety of sentence types than the affixal analysis. Section 8 will further elaborate on this idea.

Another interesting feature of Guo (2012)'s analysis is that it draws parallels with the equative comparison (e.g. John is *as tall as* Peter.') in Mandarin. The standard phrase can be instantiated by *gen Lisi* roughly: 'as Lisi', the lower Deg can be filled by *yi-yang* 'same', and the lexical adjective remains in its base-generated position:

(67) Zhangsan gen Lisi yi-yang gao
      Zhangsan with Lisi same   tall
      'Zhangsan is as tall as Lisi.'

(68)

```
                         TP
                   ╱          ╲
            Zhangsan_k          T'
                          ╱        ╲
                         T          PredP
                         │        ╱      ╲
                         Ø  t_k          Pred'
                                     ╱         ╲
                                  Pred          DegP
                                   │         ╱      ╲
                                   Ø      StndP      Deg'
                                        ╱    ╲     ╱     ╲
                                    gen Lisi  Deg        DegP
                                                      ╱        ╲
                                                  DiffP         Deg'
                                                   │          ╱     ╲
                                                   Ø        Deg     AP
                                                          ╱   ╲    ╱ ╲
                                                       yi yang  gao
```
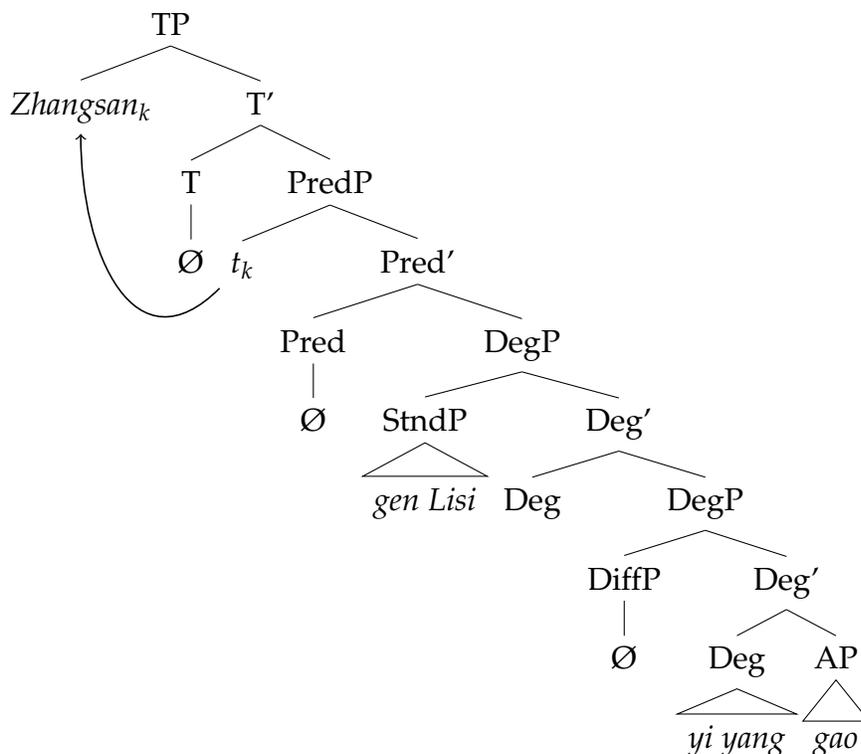
Theoretically, a common structure between differential and equative comparatives would be a desirable outcome. However, it is unclear why Guo (2012)'s analysis allows transitive comparatives, being a semantic equivalent of the *bi*-comparative, to have a different structure than *bi*-comparative, whereas the equative comparative that has a different meaning should share the same structure as superior *bi*-comparatives. Guo (2012) also notes that equatives forbid measure phrases, as an additional restriction for equative comparatives.

Sentence (69) shows how measure phrases cannot occur in equatives. There is no obvious syntactic reason why (69) is unacceptable (with the measure phrase being *3cm* or *6 feet*) in structure (68). The only possible reason is semantic,

i.e. that equatives do not allow measure phrases, because the meaning is self-contradictory.

(69)   *Zhangsan gen Lisi yi-yang gao {san-gong-fen / liu-chi}
        Zhangsan with Lisi same   tall 3.cm   6.feet
        Intended: 'Zhangsan is as tall as Lisi.'   Guo (2012, adapted from ex.73d)

The multiple DegP here is motivated by the licensing of StndP and DiffP. This analysis does not encounter the problem of Xiang (2005)'s multiple DegP where a lexical adjectival phrase is sandwiched between two functional projections (see (43)). In the discussion on *geng* above, we already see that the dual-DegP analysis helps account for the empirical data.

In addition, facts about adverb placement suggests that equatives should not receive the same treatment as *bi*-comparatives. Unlike the [*bi*-standard] sequence, which forbids free ordering with adverbs, [*gen*-standard] in equatives (67) in fact allows adjuncts to appear either before or after it.

(70)   Zhangsan (**dagai**)   gen Lisi (**dagai**)   yi-yang gao
        Zhangsan probably with Lisi probably same   tall
        'Zhangsan is probably as tall as Lisi.'

Contrasting (70) with (59), one can find that bi-comparative should not be analyzed the same as equative comparatives with *gen*–Standard. Since *dagai* can occur after *gen Lisi*, but not after *bi Lisi*), it is unlikely that equative and *bi* comparatives share the same structure.

(71)   Zhangsan (dagai)   bi Lisi (***dagai**) gao
        Zhangsan probably BI Lisi probably tall
        'Zhangsan probably is taller than Lisi.' =example (59)

In sum, the adjunct analysis of [*bi*–Standard] presented in Lin (2009); Liu (2011); Guo (2012) runs into problems in explaining (i) the unacceptability of preposed [*bi*–Standard] and (ii) adverb placement in relation to [*bi*–Standard]. This study takes the view that *bi* and the standard of comparision do not form a constituent. However, Guo (2012)'s lowerDegP analysis shows promising properties in explaining additional data with *geng* 'even more'. This study therefore adopts the head analysis of *bi* and a uniform analysis for both variants of Mandarin comparatives.

3.4.3   More on Mandarin measure phrases

As mentioned above in section 3.1, the transitive comparatives requires the measure phrase. This observation has been reported in Xiang (2005) and Grano & Kennedy (2012). An important question is why the measure phrase in transitive comparative is obligatory, but not in *bi*-comparative or the English comparative sentences.

Note that this is an orthogonal distinction from the head / adjunct anlayses. For example, both Xiang (2005) and Grano & Kennedy (2012) propose a head analysis, the former treats the measure phrase as a complement, and the latter takes measure phrases as an adjunct. For Xiang (2005), the optionality of measure phrase in *bi*-comparatives alone does not prevent analyzing the two comparatives differently or treating the measure phrase as a complement. She ascribes the optionality of the measure phrase as idiosyncrasy of individual lexical items, similar to argument structure of verbs. As discussed above, this is not satisfactory, because the difference between *bi* and transitive comparatives is not a lexical one. Even with the same lexical item, e.g. *gao* 'tall', one can see the contrast between

the two types of comparatives. Syntactically, it is unclear how a higher projection, such as DegP, dictates the complement of the AP that this DegP dominates.

However, the measure phrase does not have to be analyzed as a complement. In English, for instance, one can observe a similar contrast in terms of the optionality of adjuncts. Stockall & Husband (2014) illustrate that *in*-phrase modifications are optional for telic predicates (72), but obligatory in English atelic predicates (73).

(72)   Sarah solved/read the problem (in six minutes).

(73)   Sarah solved/read problems *(in six minutes).

If one were to analyze the *in*-phrase modification as a complement, solely based on the obligatory status, then the optionality of (72) would be left unexplained (since (73) has the same argument structure), and one might need to revise the analysis for temporal PPs too. The point here is that the obligatory presence does not mean the PP has to be a complement. Further, Mandarin behaves the same way in the SVO order with regard to temporal adverbials:

(74)   Sarah zuotian   (zai liu fen-zhong nei)   jie-da le   zhe dao
        Sarah yesterday in   six minute   within solve Perf this classfier
        nanti
        problem
        'Sarah solved the problem in six minutes.'

(75)   Sarah zuotian   *(zai liu fen-zhong nei)   jie-da wenti
        Sarah yesterday in   six minute   within solve problem
        'Sarah solved the problem in six minutes.' [9]

---

[9]Mandarin temporal adverbials generally require both a preposition and a postposition. Since *zai liu fen-zhong zhi nei* 'in within six minutes' can be preposed as a unit, this study assumes they form a constituent. Also, the prepositions and postpositions are compositional, they are therefore considered separate prepositions and postpositions, rather than a circumposition. For example, *zai liu fenzhong **yi-shang*** 'in **more than** six minutes' is also acceptable.

Mandarin adverbials and PPs generally occur before the lexical verb and direct objects (except for the *ba*-construction) and direct objects are complements in the SVO order. Sentences (74) and (75) are strong indicators that temporal adverbials should not be considered complements. Though Mandarin adverbs typically occur on the left of the predicate, they are in some cases allowed on the right.

(76)   Zhangsan ba na-ben-shu kan le   **liang ci**
         Zhangsan BA that.book   read Perf two   times
         'Zhangsan read that book twice.'

(77)   Zhangsan kan le   na-ben-shu **hen jiu**
         Zhangsan read Perf that.book   very long(-time)
         'Zhangsan read that book for a long time.'

In (77), the measure phrases *hen jiu* 'very long' clearly cannot be treated as the complement. The same right-adjunction analysis can be adopted to the adjectival predicate data, as in Grano & Kennedy (2012).

One can see that the obligartory status of a phrase is not always sufficient to support a complement analysis. The English and Mandarin data above show that measurements or frequency of events should be analyzed as adjuncts.

3.5   Other forms of comparatives in Mandarin

This section discusses some other forms of comparatives discussed in the literature. The objective of this section is to clarify that these constructions may serve as additional support for the head analysis.

Erlewine (2007) discusses extensively the comparison between verbal predicates, such as (78).

(78)   John bi Mary xihuan you-hua
         John bi Mary xihuan oil.painting

'John likes oil paintings more than Mary does.' (not: 'John likes oil paint-

ings more than he likes Mary.')

Sentence (78) is translated in this way to reflect that the Mandarin sentence does

not show the ambiguity English might have (e.g. 'John likes oil paintings more

than he likes Mary.') The transitive comparative counterpart of (78) does not allow

the clausal comparative at all. Sentence (79) cannot be expressed in the transitive

comparative, and the only option is to use *bi* as in (78).

(79)   *John xihuan Tom Mary (yi-dian)
       John like   Tom Mary a.little
       Intended: 'John likes Mary more than Tom does.'

What interests Erlewine (2007) is that Mandarin does not allow comparison

between elements within the VP (as in English 'John likes oil paintings more

than he likes Mary.'). Since Erlewine's account aims to explain both regular NP-

comparison and predicate comparison (such as 'John likes Tom more than Mary

does') with *bi*, the structure for *bi* takes VP, instead of AP, as complement. The

voice projection is motivated to include comparison between passives.
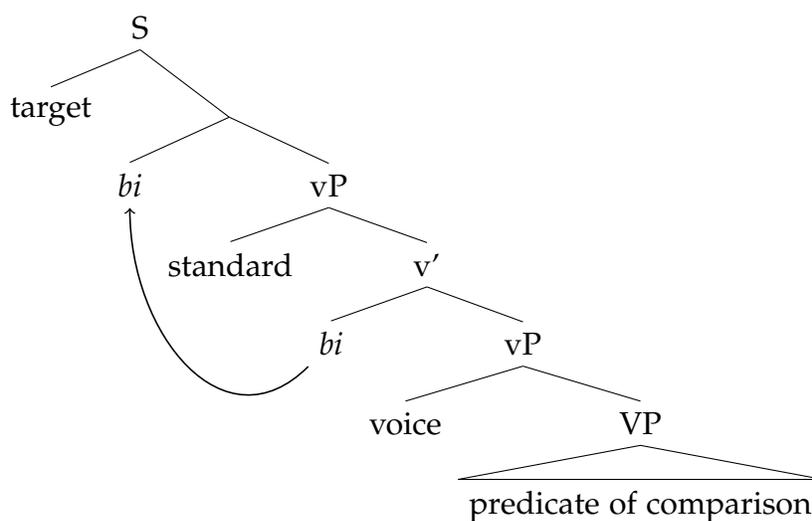
(80)

The semantics of *bi*-comparative in Erlewine (2007) does not employ any degree variable d.

(81)　　$[\![bi]\!] = \lambda G\langle e, \langle e, t\rangle\rangle \lambda y \lambda x \lambda \epsilon 1. \exists \epsilon 2 (G(x, \epsilon 1) \wedge G(y, \epsilon 2) \wedge \epsilon 1 \ggg \epsilon 2)$

Instead, two event variables, $\epsilon 1$ and $\epsilon 2$, denote the two events being compared (e.g. $\epsilon 1$ = John likes oil paintings, $\epsilon 2$ = Mary likes oil paintings) and the events each associate with an individual (e.g. y = John and x = Mary). Erlewine (2007)'s approach, following the neo-Davidsonian semantics (Parsons, 1990; Kratzer, 1996), captures the observation that Mandarin comparatives do not allow comparisons between internal arguments, since the events and their internal arguments are already 'wrapped' before they reach vP, which introduces the external argument. As a result, *bi*-comparative of VPs is unable to compare particular part(s) of the VP.

Erlewine (2007)'s proposal is of interest also because of its implication on the cross-categorial syntax-semantics. First, structure (80) explicitly draws comparison between the event and property domains in their syntax. Second, the two little-v projections in (80) suggest that either little-v phrases are iterative, or these little-v phrases are internally complex and can therefore be spelled out by multiple layers. The first option seems less plausible, because the data strongly suggest that there is a hierarchical difference between *bi* and *voice*: *bi* is postulated to undergo head movement, and voice is motivated by its function to introduce the external arguments (Kratzer, 1996). The second option, on the other hand, provides a principled account for further testing in other constructions or other languages. This split-vP approach also echoes the discussion about the *ba*-construction and the little-v. Huang et al. (2009) and Ernst (2010) show that *ba* should be analyzed as a functional category dominating the typical vP. This view is also echoed by

the discussion on the recent split-vP proposals (Sundaresan, 2013; Varley, 2013; Travis, 2013).

The data with *geng* 'more' in verbal predicates seems to further support the analysis that *geng* is a lower Deg^0 above the predicate of comparison (either VP or AP). Example (78) may include *geng* as shown in (82), which can be represented in structure (83).

(82)   John bi Mary (**geng**) xihuan you-hua
        John bi Mary **more**   xihuan oil.painting
        'John likes oil paintings more than Mary does.'

(83)

```
                    DegP
                   /    \
               target    Deg'
                        /     \
                     Deg⁰      DegP
                      |       /    \
                     bi  standard   Deg'
                                   /    \
                                Deg⁰     vP
                                 |      /  \
                               geng  xihuan youhua
```
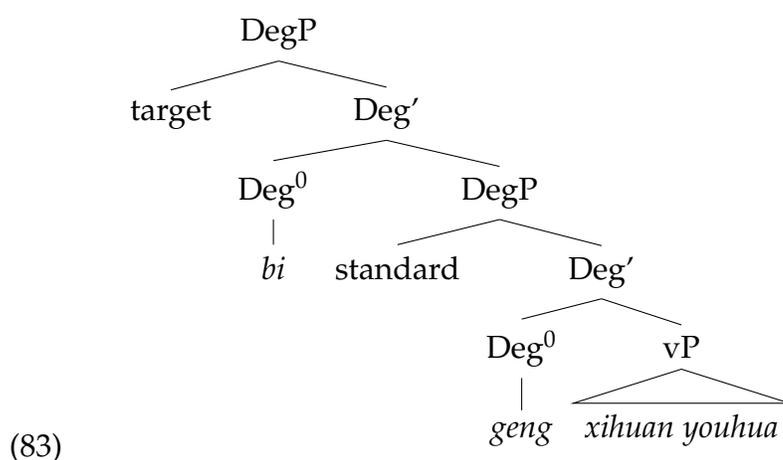
Two messages can be taken from Erlewine (2007). First, *bi* does not exclusively select AP as its complement. This suggests that one needs a notion to capture the similarity between verbal and adjectival predicates, either in terms of cross-cateogorial behaviors or non-existence of adjectives in Mandarin (Francis & Matthews, 2005; McCawley, 1992). Second, Erlewine's account relies on two layers of vP that bear different functions, which lends supports to the split-vP hypothesis.

In addition to VP-comparatives, Mandarin also allows meta-comparatives between situations. Xie (2011, 2014a) discusses an equative comparative in Man-

darin with *you*. The morpheme *you* literally means 'have' in its lexical and verbal use. However, it can also be found as a Tense/Aspect and Degree element, as shown in (84) and (85), respectively.

(84)   ni you kan guo zhe bu dianying ma
        2sg have see Exp this Clf movie   Q
        'Have you seen this movie?'

(85)   Zhangsan you ta gege   gao
        Zhangsan have his brother tall
        'Zhangsan is (at least) as tall as his brother.'   Xie (2014a)

Furthermore, since the standard in (85) can also be expressed directly by measurement (86), this motivates an analysis more generalized than comparison between individuals.

(86)   Zhangsan you liu chi gao
        Zhangsan have six feet tall
        'Zhangsan is (at least) as tall as six feet.' Xie (2014a)

Briefly, Xie analyzes *you* in (85) as a head that takes small clauses as complements, which denote situations. This enables a uniform analysis for (i) the comparison between the individual in the subject and another individual, as in the regular case (85) and (ii) the comparison between the subject and a measurement (86). Moreover, it also captures sentences like (87), where the subject is compared with a measurement, and the adjective is optional.

(87)   zher de   he   dou hen qian,   zhe tiao zhi you yi mi   (shen)
        here MOD river all   very shallow, this CL only have 1 meter deep
        'The rivers here are all very shallow. This one is only one meter deep.'

Xie (2014a) shows a head analysis that can handle comparisons between constituents that are internally complex. This addresses the conflict between the head analysis and Lin (2009)'s adjunct analysis. The latter is partially motivated by comparison between two complex units, such as (88), where the comparison is between individuals and other specifications.

(88)   ta zuotian   zai xuexiao bi   wo jintian zai jiali   kaixin
           he yesterday at school COM I   today at home happy
           'He was happier at school yesterday than I am at home today.'

           'Triple-topic comparison' in Lin (2009, example 53)

Lin (2009) takes the acceptability of (88) to indicate that the standard of comparison 'I–today–at.home' must form an adjunct with *bi* in the DegP, so that the triple-topic can be compared with the target 'he–yesterday–in.school'. Xie (2014a)'s aim was to argue that *you*-equatives are structurally different from Lin (2009)'s *bi*-comparatives. However, it is important to note that *you* is analyzed to be at a dominating projection. Therefore, the head analysis of *you* is orthogonal to the head/adjunct analysis of *bi*. Committing to Xie (2014a) that *you* compares situations does not force us to analyze [*bi*–Standard] as an adjunct. Consequently, (88) can be explained also by the head analysis of *bi*, as long as *wo jintian zai jiali kaixin* forms a constituent that denote a situation. Such a constituent can be a small clause, as in Xie (2014a), or a CP/TP.

Erlewine (2013) suggests the following structure for *bi*, which is compatible with the meta-comparison between situations. In (89), the comparison is made between two TPs, where the target and the standard do not have to form constituents with *bi*, and only the predicates (either VP or adjectival phrase) have to form a constituent.

(89)

```
                    TP
         ┌──────────┴──────────┐
      ┌──┴──┐              ┌────┴────┐
   Target   VP          bi          TP
           ┌─┴─┐              ┌──────┴──────┐
        ~~predicate~~      Standard        VP
                                         ┌──┴──┐
                                        predicate
```

<div align="right">
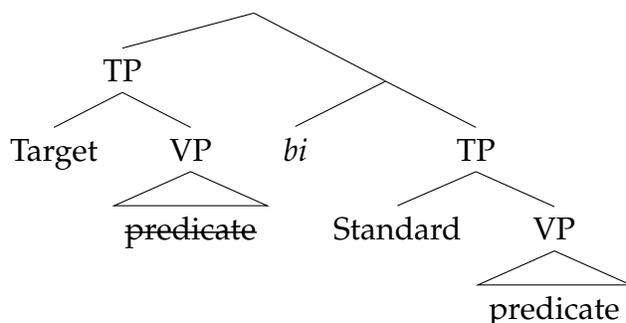
Erlewine (2013, example 31)

</div>

With the Comparative Deletion Requirement (CDR), (89) handles both the simple comparatives and multiple comparatives[10].

The scope of this study cannot cover a detailed discussion of the more complex forms of comparatives. The message here is that the head analysis is fully compatible with the empirical data, in which each of the Target and Standard of comparison do not form a constituent.

3.6 Interim summary for the comparative alternation

- This study argues with Xiang (2005); Erlewine (2007); Grano & Kennedy (2012), contra Lin (2009); Liu (2011); Guo (2012); Su (2012), that *bi* is the head of the comparative construction.

- For transitive comparatives, this study argues with Grano & Kennedy (2012) that transitive comparatives are formed by head movement from A^0. For the status of measure phrase / differential function, this study argues with Grano & Kennedy (2012) that it should be a right-adjunct in transitive com-

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[10]Erlewine (2013)'s Comparative Deletion Requirement (CDR) states that 'In a *bǐ* comparative, elide the largest elidable local VP of the target TP under identity with a local VP of the standard TP. If the target TP has no elidable local VP, the derivation is illicit'. The local VP in (89) would be the first deleted predicate.

paratives. Further, this study argues that the same treatment can be applied to *bi*-comparatives.

- There are several other morphemes that co-occur with both types of comparatives, such as *chu* and *geng*. This section on comparatives has shown that they do not refute the head analysis. From Guo (2012), this study adopts the lowerDegP between a (higher) DegP and the AP, since the structure captures the distribution with suffix *chu* and lowerDeg^0 *geng*.

- Other forms of comparatives have also been discussed. Erlewine (2007)'s head analysis for *bi* captures parallelism between AP and VP. Xie (2014a)'s discussion on *you*-equatives shows that the head analysis can handle comparisons between multiple topics , echoing Erlewine (2013)'s view.

4. PARALLELISM ACROSS CATEGORIES

In chapter 2, we have seen several properties of the *ba*-construction that suggest the *ba*, which heads the functional projection above the VP, selects only bounded predicates (Liu, 1997; Thompson, 2006). Chapter 3 has shown that the two variants of Mandarin comparatives should receive a uniform treatment. The measure phrase in transitive comparatives shows interesting parallels with *in*-PP in events (see examples (72)–(77)). Part of the goal of this study is to extend the boundedness analysis from the *ba*-construction to transitive comparatives. To this end, this section discusses various studies and approaches to similar cross-categorial behaviors, in order to justify the extension from the verbal domain to the adjectival domain.

One can see that different categories (and their functional projections) can behave similarly in syntax (Chomsky, 1970; Embick & Noyer, 2007; Harley & Noyer, 1999; Borer, 2005a,b, 2013; Marantz, 1997) and semantics (Krifka, 1998; Rothstein, 2004; Filip, 2001). This section also discusses the implications of the different approaches to handle cross-categorial behaviors.

4.1 Parallels in syntax

Since Chomsky (1970), scholars have observed similarities across syntactic categories. The X-bar theory captures the similarity in phrase structure across categories. For each phrase, a maximal projection XP must have a head X / X^0 and can (optionally) have a specificier WP, and a complement YP.

(1)

```
        XP
       /  \
     WP    X'
          /  \
         X    YP
```
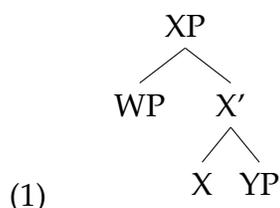
The X-bar theory hypothesizes that all categories share the same structure. The label X represents the variable syntactic category. The significance of this hypothesis is that it provides a simple explanation as to how language is structured and how sentences are put together from words. The structure of language is considered part of the architecture in the Universal Grammar. More recent iterations of the theory (Chomsky, 1995), the maximal projection can also be represented with bare heads. This is, however, not crucial for the current discussion, because the same mechanism still applies across the categories. Also, there are proposals that argue for specific relative order between the head and its complements (Kayne (1994)'s Linear Correspondence Axiom), or the status of specifier of a phrase (Lohndal, 2013). Since this study does not provide direct answer to these questions, these works will not be reviewed here.

Since the generative grammar is concerned with the formation of sentences, it is necessary to address how individual components are chosen and interact with other components in the sentence. The approach in Selkirk (1982); Di Sciullo & Williams (1987)[1] is considered lexicalist, since it assumes that category information (i.e. nounhood, verbhood, *etc.*) is stored in the lexical items, when the items are included in building sentences. Examples (2)–(4) from Chomsky (1970) show that the gerundive nominal 'refusing' and the noun 'refusal' preserves the argument structure of their verbal counterpart 'refuse(d)' in (2).

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[1]Previous studies generally recognizes that Chomsky (1970) only points out the similarity between categories, but does not entail either the lexicalist or the constructivist approach.

(2)   John has refused the offer.

(3)   John's refusing the offer

(4)   John's refusal of the offer

The lexicalist theory suggests that words from the mental lexicon in a speaker's mind would dictate the type of phrase. As a result, the category of the projection (such as XP in (1)) is determined by the lexical item the speaker has chosen for X^0. English has a certain degree of inflectional morphology, so telling nouns from verbs is not always difficult, given the distribution of the words in sentences. For example, we know that *hammer* is a noun in 'two large *hammers*' and a verb in 'John *hammered* the nail flat', based on their syntactic distribution and morphology. However, there are cases where the spoken/written forms of nouns and verbs are identical. For example, *cut* or *dance* in English are pronounced exactly the same whether they are found to be a noun or a verb. This makes it difficult to make claims about the direction of category conversion.

An alternative approach is to assume that words do not come into structure building with built-in category information. The Distributed Morphology theory (DM) takes visible/audible forms as the output, rather than the input, of the syntactic derivation Marantz (1997); Harley & Noyer (1999); Embick & Noyer (2007). For example, the semantic contents of *refuse/refusing/refusal* in (2)–(4) enter the syntactic structure without committing to any category. It is the syntactic structure in sentence (2) that determines a verb is required, hence we do not see *refusing* or *refusal*.

The concept that the semantic contents are not specified with syntactic category is known as *underspecification*. The temporal analogy that syntactic structure is built before the visible/audible form shows up is often called *late insertion*. The

underspecified items (i.e. the category-neutral bundle of semantic contents) are called *roots*.

This constructivist approach (since it postulates that the construction is the origin of the difference) does not run into the same problem as the lexicalist approach. Under the latter, it is predicted that the mental lexicon would have to store an entry for each category. For instance, there would be two entries for *cut* and *dance*. This treatment can be problematic for languages that routinely show no morphological marking in category conversion, such as Chinese.

On the other hand, the lexical items under distributed morphology are roots (Pesetsky, 1995). What all roots share is that they are l(exical)-morphemes (i.e. they are non-functional). In Borer (2005b)'s term, these lexical morphemes contain encyclopedic knowledge (i.e. lexical semantic contents), but not category identity. Immediately governing the l-morphemes are f(unctional)-morphemes, which include Determiners for nouns; v, Aspect and Tense for verbs. By inference, Degree would be the f-morpheme for adjectives. This discussion is relevant for the current study, because the similarity between verbal and adjectival predicates can be explained in terms of the similarity between the f-morphemes. Empirically, the study aims to find out whether there is a significant correlation between the boundedness of the predicates and the choice of sentence type (e.g. *ba*-construction vs. canonical SVO order). The distributed morphology theory would provide a possible explanation for the boundedness constraint across categories.

A related question is whether or not all languages have the same set of universal categories, such as N, V, A and P (adpositions). Baker (2003) hypothesizes that all languages would have the four distinct categories. He defines these categories in terms of the functions of these items, such as the referential function of nouns

and the ability to (directly) take arguments for verbs. Luuk (2009, 2010) claims that nouns and verbs in Estonian are distinct categories and there is a third class dubbed 'flexibles', which may undergo conversion. Chung (2012) argues that in Chamorro, an Austronesian language that extensively uses conversion, the distribution and morphology show evidence for the existence of different categories. She then concludes that the categories N, V and A should actually be universal.

While acknowledging Chung (2012)'s arguments that Chamorro shows different categories on the surface, Embick (2012) correctly points out that Chung does not fully answer the question as to what is the origin of the categorical difference. Embick (2012)'s commentary recasts the discussion in Chung (2012) and shows that the DM approach with acategorical roots is equally capable of accounting for the phenomenon.

An apparent problem for DM is potential overgeneration. If all roots are underspecified, then one might expect many nouns to appear in verbal environments. However, (5) and (6) show that this is not the case.

(5)   *John **spidered** yesterday.   Barner & Bale (2002)

(6)   *Don't **broom** my mess.   Barner & Bale (2002)

Since (5) and (6) are both unacceptable, it shows that DM overgenerates by allowing all roots to appear in verbal contexts. Barner & Bale (2002) argue that this does not constitute a forceful argument against DM or underspecification with two arguments. First, they argue that the lexicalist approach with conversion is equally capable or incapable in handling overgeneration. For instance, lexicalists would have to formulate conversion rules that forbid $_N spider$ or $_N broom$ to undergo conversion. Even if one may invoke notions like argument structure for *broom* (6) to constrain the conversion rules, it is unclear why this is inherent to

lexicalism but incompatible with underspecification. Second, Barner & Bale do not consider overgeneration a problem for grammar. In their words, 'theories of grammar are designed to account for the set of possible grammatical utterances, and nothing more. What one knows about language, and what one does with this knowledge are two different fields of inquiry' (Barner & Bale, 2002, p.777). In other words, there are other factors that can rule out possible utterances. They further show that appropriate contexts and pragmatics are also important in acceptability of sentences, as shown in (7), which shares the same verb *spidered* with (5).

(7)   The agile climber spidered up the face of the mountain.

In addition to the two arguments given in Barner & Bale (2002), the data concerning overgeneration may also be explained by accidental, lexical gaps. Sentence (8) in English is unacceptable, which may be considered an overgeneration. However, the use of *ce1* 'car' in Cantonese in the verbal environment is fully acceptable.

(8)   Mary car-ed Peter home. (*Intended*: 'Mary drove Peter home.')

(9)   Mary ce1 zo2 Peter faan1 uk1-kei2
        Mary car Perf Peter return home
        'Mary drove Peter home.' (*ce1* 'car' as transitive verb)

Studies on typology have proposed that there are correlations between parts of speech and syntactic distribution within a langauge (Hengeveld et al., 2004). The contrast between English (8) and Cantonese (9) suggests that languages may differ in how much they allow roots to appear in different environments. Therefore, it is misleading to conclude that not all nouns can appear in verbal environments from

sentences like (8) and claim that DM overgenerates. In addition, the use of *taxi-ed* is an acceptable alternative to *car-ed* in (8)[2]. This indicates that the grammar does allow nouns to be used in the verbal environment. The unacceptability of *car-ed* or *broom-ed* can be explained by the existing verbs *drive* and *sweep* that block these derived terms.

Croft & van Lier (2012) separate the universality of the existence of category distinction from universality of the members of categories. Essentially, they argue that while all languages would make some distinction between categories at various degrees (for example some languages have more categories than others), it is not the case that all languages must have the same inventory of categories. Rather, Croft & van Lier suggest that category distinction is language-specific. Different languages may divide the same number of concepts into different number of categories. In Croft & van Lier (2012, p.70)'s term, '(l)exical categories are not universal – they are discrete, but language-specific ways of cutting up a conceptual space, in many different ways both within and across languages'. This approach differs from DM in that it seeks answers for category distinction from concepts and functions of words, rather than focusing on syntactic distributions. It is important for the current study that these two approaches are both compatible with the similarities between verbal and adjectival predicates. Both V and A can be gradient and bounded. From a more semantic and functional perspective, both verbs and adjectives require arguments (typically individuals). From the DM perspective, the distributions also show similarities across V and A, such as modification by measure phrases and boundedness, though the f-morphemes in the respective domains (little-v or T and degree) have different phonetic realizations.

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[2]I thank Ronnie Wilbur for this example.

This section uses the debate in the status of category and distributed morphology as a starting point for our discussion on cross-categorial behaviors. More specifically, there are several studies exploring the similarities between verbs and adjectives. There has been a debate in East Asian languages about whether adjectives form their own distinct category (more specifically, from verbs), as in McCawley (1992); Paul (2012) for Mandarin and Kim (2008) and Kim (2002) for Korean. In the discussion on comparatives in chapter 3, Erlewine (2007) proposes that *bi* is the head of the verbal predicate. This analysis implicitly says that adjectives in Mandarin share the same syntactic distribution with verbs. In other words, Mandarin does not show a clear distinction between adjectives and verbs, since syntactic category is defined in terms of their distribution. While the verbal analysis of *bi* can account for the comparisons between verbal predicates, one cannot claim that V and A in Mandarin are equivalent. A potential problem is that the *ba*-construction exclusively selects verbal, but not adjectival predicates. An account that put V and A under the same syntactic category would then predict that adjectives can be the direct complement of *ba*. However, since adjectives are exclusively intransitive, in the sense that they do not require objects, the non-existence of *ba–adjective* combination can be explained by the transitivity requirement of *ba*.

4.2 Parallels in semantics

The discussion up to this point has primarily been concerned with structural similarities. The following will discuss the semantic similarities across domains, focusing on *mereology* and *gradability*. Mereology is the study of part-whole relation. For the purpose of the current study, mereology is relevant because this study is concerned with the modelling of events and scales and the presence of their boundaries.

Within the mereology framework (Link, 1983; Krifka, 1998; Filip, 2001), many properties of events have parallels in the nominal domain. Krifka (1998) argues that the interpretation of various event types, such as motion events (e.g. *John walks to school*) and change-of-state predicates (e.g. *John baked the bread*), can all be explained in terms of part-whole relation. That is, the points in the path in motion events and the sub-events with change-of-state events can be treated as parts and the entire event is the larger sum of these parts.

Filip (2001) discusses the parallels between noun phrases and verbal predicates and argues that the semantic structure is the reason for the interaction between noun phrase and the telicity of verb phrase. More specifically, one can observe the following contrast in the choice of PP for duration measurement. Sentence (10) with *the sandwich* as its object allows only *in*-PP modification, which indicates that *ate the sandwich* is telic. On the other hand, (11) only allows *for*-PP modification, which means *ate soup / blueberries* does not denote an endpoint (see Verkuyl (1972); Dowty (1979, 1991); Tenny (1987, 1994), among many others).

(10)   Mary ate the sandwich { in an hour } / { ?for an hour }.

(11)   Mary ate soup / blueberries {??in an hour } / { for an hour }.

Both Krifka and Filip make use of the distinction of cumulativity and quantization to model the similarity between nouns and verbs. Krifka (2001) defines cumulativity as the following:

(12)   A predicate P is cumulative iff
        (i) $\forall x, y[P(x) \land P(y) \rightarrow P(x \oplus y)]$
        (ii) $\exists x, y[P(x) \land P(y) \land \neg x = y]]$

Condition (i) means when two entities x and y are added together, they can still be described with the same denotation. Condition (ii) ensures x and y are distinct elements. For example, in a situation when Mary said she saw that John left, and Jane also said she saw that John left, we cannot infer that John left twice or conclude that 'leaving' is cumulative. The reason is that 'John' in the two utterances is the same person.

Cumulative predicates include 'wine' or 'apples'. If an object x called 'wine' is added to another object, which is distinct from x, let's call it y, which is also wine, we have a new object containing x and y. Since we can reasonably describe this new object as 'wine' (as opposed to 'two wines', which is possible in a different context), we can conclude that 'wine' denotes a cumulative predicate. The same characteristic can be applied to verbal predicates. Atelic predicates are typically cumulative. For example, two distinct instances of *run*, when put together, can also be described as 'run' (such as a prolonged running event). Likewise, putting two instances *John built houses* together, one can still describe the whole event as 'building houses'.

The opposite of cumulativity is the property of *quantization*. Krifka (2001) defines quantized predicates as:

(13)   A predicate P is quantized iff

$$\forall x, y[P(x) \land P(y) \rightarrow \neg y < x]]$$

Using the example in Krifka (1998), if an element x can be called '3 apples', then it is impossible for any proper subset of x to be described as '3 apples'. This captures our intuition that part of '3 apples' can be an apple, or two apples, but not three apples. Similarly, a proper part of quantized events cannot be identical to its superset. If we say 'John made **four cakes**.', the part of the event, for example

John making one cake, cannot be described as 'John made **four cakes**.' It shows that the verbal predicate 'make four cakes' is quantized.

Gradability has received much attention in the past decade. Most of the studies are concerned about the interpretation of adjectives and comparatives. Some studies investigate how gradability is manifested in other domains. Constantinescu (2011) shows that nouns (and noun phrases) display gradability properties, e.g. modifications in *such*, *quite* and *more of an N* construction. Xie (2011) also discusses how gradability is manifested in various categories. He investigates several different phenomena and each shows some level of apparent mismatch. One of them is the 'possessive equative construction' in Mandarin, also discussed in section 3.5. The *you*-equatives show that *you* 'have' can mark equative comparatives by taking TP complements (denoting situations), in addition to being a lexical verb that takes nominal complements or a perfective marker taking verbal complements like its English counterpart. Xie advocates a view that *you* denotes the same semantic function as other uses such as possessive (14) and existential sentences (15).

(14)   Zhangsan you yi ben shu

    Zhangsan have one Clf book

    'Zhangsan has a book.'   (possessive use of *you* 'have')

(15)   (zhuo-zi shang) you yi ben shu

    table on have one Clf book

    'There is a book on the table.'   (existential use of *you* 'have')

An interesting similarity across the three uses of *you* is their scalarity. In all cases, *you* bears the meaning of 'at least X', in addition to the identity reading. For instance, the degree use of *you*-equative may also mean 'X is at least as tall

as Y'. For possessives and existentials, sentences (14) and (15) both display a similar effect, i.e. there can be more than one book in Zhangsan's possession or on the table. Therefore, the similarity is beyond the surface word order or the morphemes used. To unify the various uses, Xie (2011) proposes a degree analysis, in which the complement of *you* contains a degree term that denotes a 'subset/subinterval of' relation[3].

Wellwood et al. (2012); Wellwood (2015) proposes that English *more* should be treated with a uniform analysis across nouns, verbs and adjectives. Wellwood's proposal goes beyond the syntactic similarity and argues that the semantics is also structure-preserving across different domains (of entities, events and properties), i.e. the semantics is homomorphic across different categories. An important implication is that there is no need for multiple lexical entries for English *more*. The unified account of *more* is adequate to explain its behavior across categories and domains.

The implication of these studies is that the semantic notion *gradience* is found across different lexical categories. Interestingly, the same morpheme or construction is often used for different categories and domains, such as *more* and partitive *of* in English, and Mandarin *you* 'have'. Theoretically, the generative framework has always been looking for simple mechanisms that account for a wider range of data. What this section has shown is two examples of semantic accounts in mereology and gradability that capture cross-categorial behaviors.

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[3]Xie (2011) also elaborates on the pragmatic reason for the preference for the exactly / identical reading, despite his analysis that the semantic default would be the superior/non-identity reading. The pragmatic issue is, however, not crucial for the current study.

4.3 Summary

Chapters 2–4 have reviewed the constraints and previous analyses of the predicate alternation in the VP (chapter 2) and in the AP (chapter 3). The *ba*-construction and the SVO canonical word order can both express transitive events. The transitive comparatives and the *bi*-comparatives both express superior comparison between two entities. This study therefore considers that these two pairs are semantic equivalents and the alternations are reflections of the choice of functional morphemes in v^0 or Deg^0, while the alternations share the same underlying syntactic structure. Independently motivated for each of the verbal and adjectival predications, the two functional categories, *ba* in VP and the transitive Deg^0 in comparatives, select their complements based on the lexical semantics of *boundedness*.

Chapter 4 has shown that it is common to see different syntactic categories or semantic domains display similar behaviors. This leads to the hypothesis of this study that categories V and A might share a common semantic structure, which forces the different categories to be subject to the same constraints and allows them be interpreted in similar manner.

5. HYPOTHESIS: BOUNDEDNESS ACROSS CATEGORIES

Based on the previous discussion, we have observed that (i) the *ba*-construction selects only a specific subset of verbal predicates; (ii) the transitive comparative selects a subset of adjectival predicates, and (iii) a homomorphic approach to the cross-categorial phenomena provides a more parsimonious theory to explain the relation between syntax and semantics in both verbal and adjectival domains. This chapter proposes the following *Boundedness constraint*:

(1)   **Boundedness constraint**: The Deg^0 in Mandarin selects its complement predicates based on their boundedness.

This constraint covers degree phrase in both VP and AP in Mandarin. This study hypothesizes that the constraint accounts for the acceptability judgments regarding the four constructions: *ba*-construction, SVO, transitive comparative and *bi*-comparative. The selectional pattern of the four constructions are summarized below in table 5.1:

	VP	**AP**
$[\![Deg_{bound}]\!]$ requires bounded predicates	*ba*-construction	transitive comparative
No restrictions without $[\![Deg_{bound}]\!]$	regular SVO	*bi*-comparative

Table 5.1: Summary of predicted patterns of acceptability

Formally represented, the functional morpheme Deg(ree)$_{bound}$ has the following denotation (2), which has semantic type $\langle\langle d, et\rangle, et\rangle$.

(2) $[\![Deg_{bound}]\!] = \lambda P_{\langle d,\langle e,t\rangle\rangle}.\lambda y\lambda x\lambda d_1.\exists d_2(P(x,d_1) \wedge P(y,d_2) \wedge d_1 \succcurlyeq d_2)$

The semantic type of $\llbracket Deg_{bound} \rrbracket$ is parallel to Grano (2011)'s analysis for Mandarin *hen*, which takes gradable adjectives as its complement. The Deg_{bound} function in (2) selects gradable predicates that are degree-specified, i.e. bounded ($\lambda P_{\langle d, \langle e,t \rangle \rangle}$) and returns a predicate that can be saturated by another individual ($\langle e,t \rangle$).

Since the generalized degree morpheme may select verbs and adjectives, P can refer to scalar predicates in event or property domains. For events, the scalar predicate P can be realized by any predicates that denote change-of-states. This rules out stative predicates, but still includes predicates with binary values. For comparison of properties, the function $\llbracket Deg \rrbracket$ works straightforwardly as Grano & Kennedy (2012) argued, where non-scalar predicates, which do not include degree d, do not form acceptable sentences.

(3)

$$
\begin{array}{c}
\text{DegP}_{\langle e,t \rangle} \\
\swarrow \qquad \searrow \\
\text{Subject} \qquad \text{Deg}' \\
\qquad \swarrow \qquad \searrow \\
\text{Deg}^0{}_{\langle \langle d,et \rangle, \langle e,t \rangle \rangle} \qquad \text{BoundedP}_{\langle d,et \rangle} \\
\qquad\qquad \swarrow \qquad \searrow \\
\qquad\qquad \text{Object} \qquad \text{Bounded}' \\
\qquad\qquad\qquad \swarrow \qquad \searrow \\
\qquad\qquad\qquad \text{Bounded}^0 \qquad \text{PredicateP} \\
\qquad\qquad\qquad\qquad\qquad \swarrow \qquad \searrow \\
\qquad\qquad\qquad\qquad\qquad \text{Predicate}' \quad \text{Measurement} \\
\qquad\qquad\qquad\qquad\qquad \swarrow \quad \searrow \\
\qquad\qquad\qquad\qquad \text{Predicate} \quad \text{XP}
\end{array}
$$
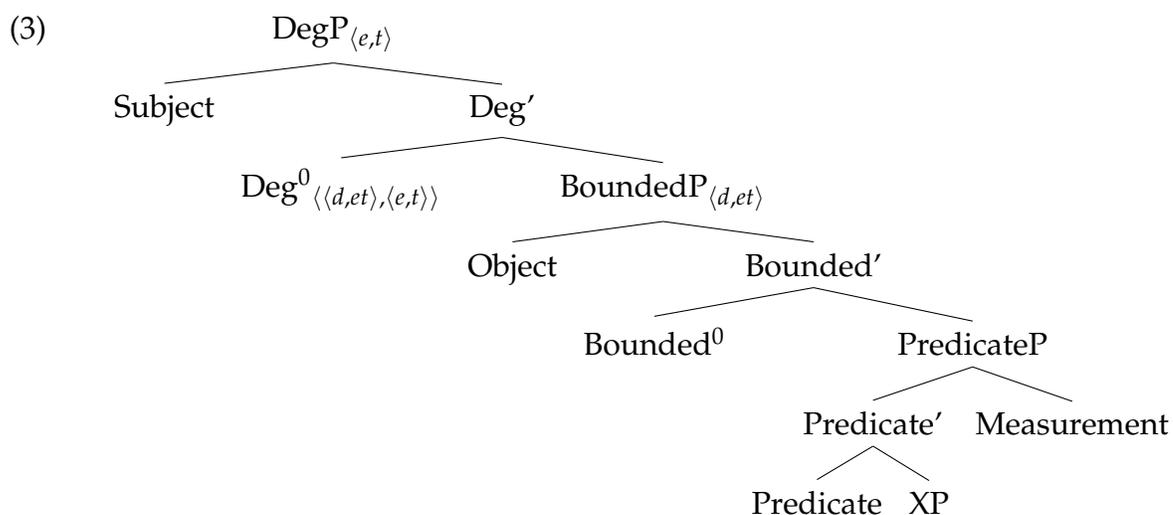
Diagram (3) is a generalized structure for VP and AP. When the syntactic head Deg^0 hosts the semantic function $\llbracket Deg \rrbracket$, the PredicatePhrase must be a bounded predicate. As discussed in the previous chapter, there are several devices that license the predicate boundary, e.g. quantized object (or 'G-specific' NPs by Liu (1997)'s account) or telic events for the VP, or measure phrase 'a little'; 'two inches' for AP).

5.1 Prediction 1: $[\![Deg_{bound}]\!]$ selects bounded predicates

The most straightforward prediction is that *ba*-construction would select predicates that are bounded, which can be manifested by quantized direct object, telic endpoint, or perfective aspect *le*; and that the transitive comparative would select predicates that denote a bounded scale, such as predicates with measure phrase or close-scale.

Since there are many ways to manifest boundedness for VP and AP predicates, this study can only select the presumably more predicative ways, such as perfective aspect *le* in VP or measure phrase in AP. I will provide more details on these factors in chapter 6.

5.2 Prediction 2: Sentences without $[\![Deg_{bound}]\!]$ do not select predicates

The *Boundedness constraint* (1) postulates that $[\![Deg]\!]$ is responsible for the selectional pattern. The second prediction is that with the absence of $[\![Deg]\!]$, there would be no restriction on the lexical predicates in terms of boundedness. This is predicted to be the case for the sentence types SVO and *bi*-comparatives.

However, this does not preclude the possibility that SVO order or *bi*-comparative in general have selectional criteria other than boundedness. This would involve control of other confounding or random factors.

5.3 Prediction 3: Similar effects for Deg across VP and AP

Since the boundedness constraint (1) is hypothesized to be active in both VP and AP, it would also mean that the constraint predicts the patterns in VP and AP to be similar. That is, the *ba*-construction and the transitive comparative are predicted to be more acceptable than the SVO and *bi*-comparatives.

5.4   Prediction 4: Transitive comparatives are highly constrained

Surprisingly, the same boundedness constraint is predicted to impose different constraints on the transitive comparative than it would on the *ba*-construction.

Unlike verbs, adjectives do not have a separate morpheme to mark resultative or endpoint of scales. Rather, the distinction is made lexically in the word choice, such as *man* 'full' vs. *da* 'big'. In general, the boundedness constraint predicts that the transitive comparative would accept only bounded adjectival predicates. However, since the transitive comparative is derived through head movement of the lexical adjective, bounded adjectives like *man* 'full' would violate the head movement constraint, because such adjectives are phrasal. This syntactic constraint therefore forbids bounded adjectives from raising to the Deg^0 position in (3).

As a result of the confounds from syntax and information packaging in the lexicon, the transitive comparative with a bounded adjective, with or without the measure phrase, is predicted to be less acceptable than unbounded adjectives in the transitive comparative. In the following minimal pair, (4) is predicted to be less acceptable than (5).

(4)   beizi man pingzi
      cup   full bottle
      'The cup is fuller than the bottle.'   (bounded predicate and no MP)

(5)   beizi da pingzi
      cup   big bottle
      'The cup is bigger than the bottle.'   (unbounded predicate and no MP)

Similarly, (6) is predicted to be less acceptable than (7).

(6)   beizi man pingzi yidian
      cup   full bottle a-little

   'The cup is a little fuller than the bottle.' (bounded predicate + MP)

(7) beizi da pingzi yidian
    cup   big bottle a-little
    'The cup is a little bigger than the bottle.' (unbounded predicate + MP)

In addition, the boundedness constraint still requires the transitive comparatives to have a bounded predicate, which means (7) would be more acceptable than (5). Since (7) does not show any syntactic or semantic violation, (7) is predicted to be acceptable. The pair (5) and (6) each demonstrates some violation (syntactic for (6) and semantic for (5)), the current proposal does not make any prediction between their relative acceptability.

To summarize, the following patterns in acceptability are predicted for the transitive comparative:

- Unbounded predicates are preferred

  - sentence (5) > sentence (4)

  - sentence (7) > sentence (6)

- The presence of measure phrase is preferred

  - sentence (7) > sentence (5)

  - sentence (6) > sentence (4)

The following chapter will describe the experimental study and provide more details regarding how the data can test the hypothesis.

6. METHODOLOGY

This chapter describes the participants and procedures of the experimental study. By adopting acceptability judgment and comprehension tasks, this study relates speakers' interpretation to the acceptability of combinations of sentence types and predicate types.

6.1 Participants

Self-reported native speakers of Mandarin participated in the study (N = 23; 13 women and 10 men). The age ranges from 18 to 42 (M= 24.6 years, SD = 6.04 years). They were all recruited through posters on Purdue campus. All instructions were in standard Mandarin (audio)/ simpified characters (visual), because the participants are all from Mainland China. The materials in both original Mandarin and English translation are provided in the appendix.

Fig. 6.1 gives an approximate representation of the regions where the participants have lived for the longest in their lives. In the pilot study, a participant from Taiwan showed systematically different judgments to a group of experimental sentences[1]. Therefore, the experimental study did not include any speakers from Taiwan. It should also be noted that there might potentially be regional differences. However, due to our small sample size, we are unable to find any pattern in this regard.

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[1]The participant in the pilot also mentioned after the experiment session that transitive comparatives in general are unacceptable.
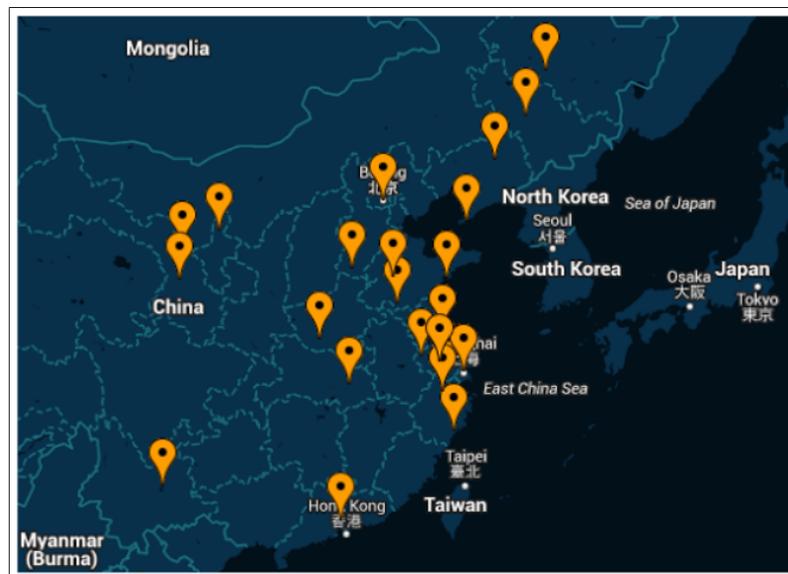
Figure 6.1.: Origin of participants

6.2 Procedures

In the experiment sessions, the participants were first informed about the experimental procedures and asked to sign the participation consent forms. They were then asked to put on the headphones and listen to the instructions on experimental procedures in the computer interface. After the introduction and instructions about the experiment, participants were first presented the stimuli in text on a computer screen and asked to rate the sentences for acceptability from 1 to 7 (best), as shown in figure 6.3. The display logic is shown in figure 6.2. In total, there are 128 items (64 experimental items + 64 fillers). Each block has 42 or 43 items. The test items are randomly assigned to the three blocks. Within each block, the order of the items are randomized for every particpant. This within-block randomization is done automatically in the computer interface. The instructions and the experimental items were presented with Qualtrics (http://www.qualtrics.com/).
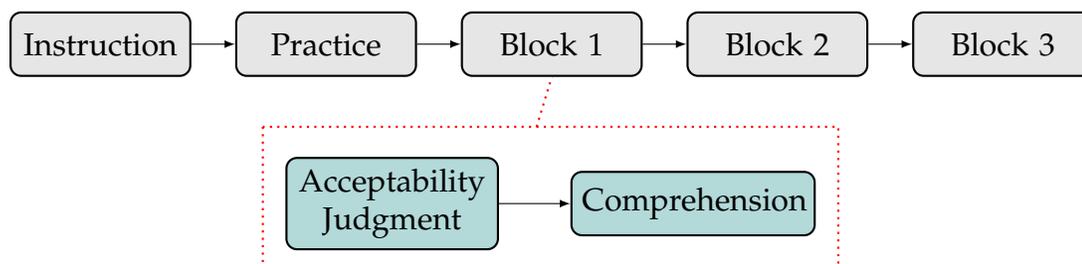
Figure 6.2.: Display logic of experiment 1 and 2

For each item, there are two parts: the acceptability judgment task and the comprehension. The acceptability judgment task shows what combinations are acceptable. The comprehension task aims to show whether the informants interpret the predicates in the sentence stimuli to be bounded.

For filler items, there are also picture stimuli in the second part. It was necessary to keep the presentation of both experimental and filler items consistent, so that participants would not know what the target structures were. All responses to filler items were collected and recorded. The acceptability judgment data of filler items were analyzed for comparison with experimental items. More details will be provided in the results chapter.

Figures 6.3 and 6.4 show the interface of the two tasks.

杯子比瓶子满一点

Figure 6.3.: Screen capture of the acceptability judgment task

For each item, the sentence stimulus is presented both visually and aurally. All the sentences are recorded by a native speaker of Mandarin and played when the page is loaded. Each sentence is played once only. After the informant indicates the judgment ('1' represents most unacceptable; '7' represents most acceptable) and confirms their choice by mouse-click, the following page shows the same sentence. In this second page, as shown in 6.4, the informant is asked to indicate the picture that suits the sentence best. The sentence will not be played again aurally in the second page. Informants are only allowed to select one picture among the four (the position of the pictures are also randomized).
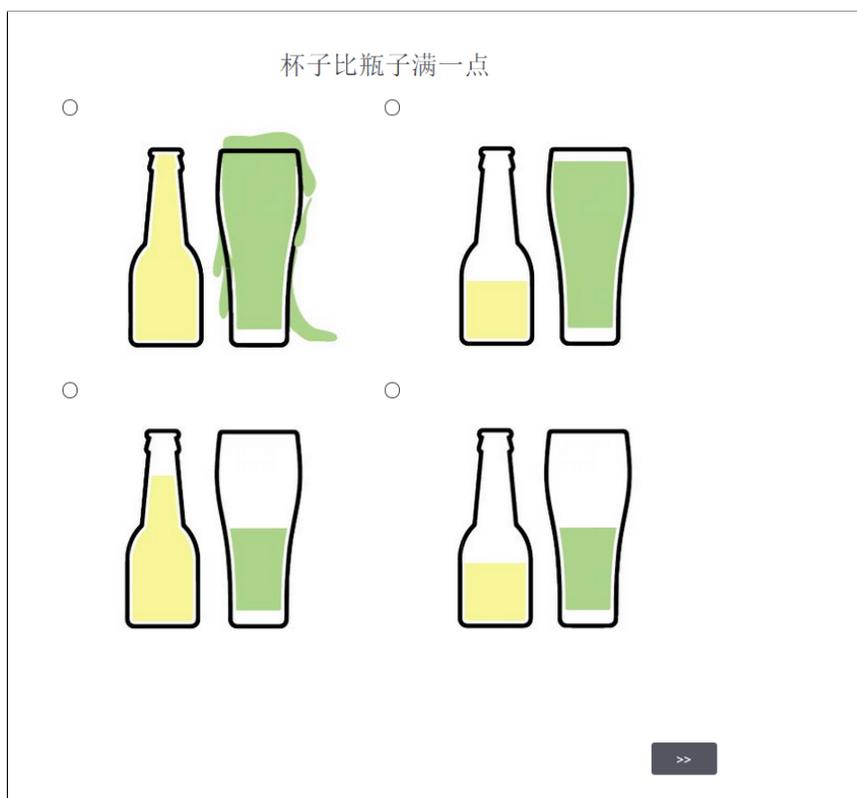
Figure 6.4.: Screen capture of the comprehension task

6.3 Verbal predicates

6.3.1 Materials in judgment task

The goal of the experimental study is to test the 'boundedness' hypothesis in both verbal and adjectival predicates. Due to the differences between the verbs and adjectives in Mandarin, e.g. events are measured in time or their degree of realization/completion, and the same parameter does not hold for comparatives, the variables need to be treated differently. This study manipulates the stimuli for verbs and adjectives differently, although they are expected to manifest the same grammatical properties. The goal of the first part of the experiment is to test whether the *ba*-construction requires bounded predicates. As we have seen in chapters 2-4, there are many factors contributing to the boundedness of a verbal predicate. Because there are no previous studies on this issue with Mandarin *ba*, this study primarily tests the canonical cases, where boundedness is seen in the post-verbal predicate and the perfective aspect marking.

This experiment adopts a 2 x 2 x 2 design. The three variables manipulated are: sentence type, the presence of secondary predicates and the presence of perfective marker *le*. Sentence type refers to the alternation between canonical SVO word order and the *ba*-construction. The presence of resultative contributes to a bounded reading. Table 6.1 summarizes the 8 conditions.

Variable 1: Sentence type

The two levels in this factor are the two tested sentence types, namely the *ba*-construction and the regular SVO order. For the ease of exposition, all the examples are from the same lexicalization of the experiment items. The other

Condition	Sentence type	Secondary Predicate	Perfective marker
(1)	*ba*	yes/bounded	yes/bounded
(2)	*ba*	yes/bounded	no/unbounded
(3)	*ba*	no/unbounded	yes/bounded
(4)	*ba*	no/unbounded	no/unbounded
(5)	SVO	yes/bounded	yes/bounded
(6)	SVO	yes/bounded	no/unbounded
(7)	SVO	no/unbounded	yes/bounded
(8)	SVO	no/unbounded	no/unbounded

Table 6.1: The 8 conditions of the VP experimental items

three lexicalizations can be found in the appendix. The following pair shows the minimal contrast:

(1)　　xiaochen ba　fan　chi wan　le
　　　　Chen　　BA rice　eat finish Perf
　　　　'Chen finished eating the rice.'

Condition 1: *ba* with bounded predicates

(2)　　xiaochen chi wan　le　　fan
　　　　Chen　　eat finish Perf rice
　　　　'Chen finished eating the rice.'

Condition 5: SVO with bounded predicates

Since the *ba*-construction is hypothesized to require bounded predicates, this study predicts that sentences in condition 1 and condition 5 are both acceptable, because *ba* and SVO are both predicted to be compatible with bounded predicates.

Variable 2: Resulative/ second predicate

One of the ways to license boundedness is the post-verbal predicate, as shown by *wan* 'finish' in (3).

(3)   xiaochen ba fan chi **wan**
         Chen   BA rice eat **finish**
         'Chen finished eating the rice.'

Condition 2: *ba* with post-verbal predicates

(4)   *xiaochen ba fan chi __
         Chen   BA rice eat __
         Predicted to be unacceptable: 'Chen finished eating the rice.'

Condition 4: *ba* without post-verbal predicates

Combined with unbounded predicates in (4), the *ba*-construction is predicted to be less acceptable. Therefore, the acceptability rating from condition 4 is predicted to be lower than condition 2.

On the other hand, the SVO order is hypothesized to be unselective with regard to its complement predicates. Therefore, this study predicts that SVO order would be acceptable with both bounded and unbounded predicates. Condition 6 differs minimally from condition 2 in the sentence type, and condition 8 from condition 4:

(5)   xiaochen chi **wan**   fan
         Chen   eat **finish** rice
         'Chen finished eating the rice.'

Condition 6: SVO with post-verbal predicates

(6) xiaochen chi __ fan
     Chen   eat __ rice
     'Chen finished eating the rice.'

Condition 8: SVO without post-verbal predicates

Both SVO sentences are predicted to be acceptable, despite their difference in the use of post-verbal predicate.

The presence of *wan* 'finish' denotes the endpoint of the eating event, and is therefore hypothesized to contribute to a bounded predicate. If conditions 6 and 8 turn out to be equally acceptable, then it supports the prediction that boundedness does not affect the acceptability of SVO sentences.

The four lexicalizations do not exclusively use *wan* 'finish' as the secondary predicate. Since the word choice of the secondary predicate is lexical, i.e. the choice depends largely on the main predicate, some other secondary predicates are chosen to produce more natural readings:

	Lexicalization	Gloss
1	*chi wan*	'eat finish'
2	*he guang*	'drink gone'
3	*xie wan*	'write finish'
4	*kan wan*	'read finish'

Table 6.2: Lexicalization of the secondary predicates

This lexical distinction is not always translated the same way to English. The close equivalent would either be 'eat/drink up' or 'finish eating/drinking'.

Variable 3: Perfective marker *le*

The third manipulation is the presense of perfective marker *le*, as shown in the contrast between (7) and (8).

(7)   xiaochen ba fan chi **le**
          Chen   BA rice eat **Perf**
          'Chen finished eating the rice.'

<div align="right">Condition 3: ba with perfective le</div>

(8)   *xiaochen ba fan chi __
          Chen   BA rice eat __
          Predicted to be unacceptable: 'Chen finished eating the rice.'

<div align="right">Condition 4: ba without perfective le</div>

The boundedness constraint predicts that (8) is less acceptable than (7), because the predicate *chi fan* 'eat rice' is unbounded and therefore incompatible with the *ba*-construction.

In addition, Sybesma (1997) proposes an alternative analysis for *le* as a 'realization marker' of events. Under his analysis, *le* does not denote completion as many have claimed. Rather, *le* marks the inception of an event and is agnostic to the endpoint of the event. This account therefore predicts that sentences with *le* can also be acceptable for inception reading. Theoretical accounts predict that (7) allows inception reading (i.e. "Chen has started eating at the rice"), in addition to the completion reading, which is generally assumed. The two readings differ in the entailment on the rice remaining: the inception reading allows there to be rice untouched; the completion reading entails that the entire rice dish is consumed. It is important to note that it does not constitute a counterexample for the bounded-

ness constraint. Since boundedness refers to the assertion of a degree on a scale, which does not necessarily equal the termination of events, Sybesma (1997)'s realization analysis of *le* does not contradict with the boundedness constraint.

The prediction of this contrast will be tested in the comprehension part of the study. Picture stimuli will illustrate different entailments, and informants chose one picture (out of four) as their response.

In addition to the predictions made by the three variables, two points should be noted. First, the current analysis does not make predictions about the acceptability of the two types of boundedness marking (secondary predicate and perfective marker). In other words, the boundedness constraint predicts sentences to be acceptable with *at least* one boundedness marker. Second, the experimental items all use bare NPs as the internal arguments. Mandarin allows bare NPs to be arguments with a definite interpretation. This study attempts to eliminate the confounding factor by using bare NPs as the internal arguments in all experimental sentences.

6.3.2 Materials in comprehension task

The second part of the experiment is a comprehension task. The purpose of this task is to confirm that the participants are sensitive to the bounded distinction, which is manipulated by the presence of secondary predicate (*wan* 'finish' or *guang* 'gone') and perfective *le*.

The picture stimuli were created specifically for this experiment. The full list of stimuli can be found in the appendix.

The experimental sentences are manipulated exactly the same way as the judgment task. For each sentence, the comprehension task follows immediately the judgment task. That is, all the sentences used in the judgment task also appeared

in the comprehension task with corresponding picture sets, including fillers. For verbal predicates, there are four types of picture stimuli, as shown in table 6.3. The picture set used here corresponds to the lexicalization #1, as shown in sentences (9) and (10).

Picture Stimulus	Prediction
Type #1	Completion reading: Chosen for Bounded sentences
Type #2	Unrealization reading: Not expected to be chosen
Type #3	Ongoing reading: Chosen for Unbounded sentences
Type #4	Distractor: Not expected to be chosen

Table 6.3: Picture Stimuli for the Comprehension Task in VP

The independent variable here would be the boundedness of the predicates, as discussed in section 6.3.1 (more specifically, variables 2 and 3). The choice of the picture would be the dependent variable, which indicates whether partici-

pants are sensitve to the secondary predicates and perfective *le* in term of their interpretation of the sentences. The contrast is shown in (9) and (10) below.

(9)   xiaochen ba fan chi **wan** **le**
        Chen   BA rice eat finish Perf
        'Chen finished eating the rice.'   (bounded predicate)

(10)   xiaochen chi fan
        Chen   eat meal
        'Chen eats/ate the rice.'   (unbounded predicates)

6.4   Adjectival predicates

6.4.1   Materials in judgment task

The goal of this experiment is to test the hypothesis that transitive comparatives select only bounded predicates.

The main reason for separating the adjectival predicates is that the variables related to boundedness are different in nature. Items in this experiment and the one on VP are, however, randomized and presented in the same sessions to informants.

Similar to VP, boundedness can be manifested in two ways: Externally, one may add a measure phrase to impose a boundary of the scale. Lexically, one can use either an open-scale predicate or a close-scale predicate (Kennedy & McNally, 2005; Winter, 2006). Syntactically, one may use a measure phrase that imposes the boundary to the scale, such as *yi dian* 'a little'. With the manipulation of sentence types, the experiment has a 2 x 2 x 2 design. Table 6.4 summarizes the 8 conditions.

Condition	Sentence type	Scalar Structure	Measure Phrase
(1)	Transitive comp.	bounded	yes/bounded
(2)	Transitive comp.	bounded	no/unbounded
(3)	Transitive comp.	unbounded	yes/bounded
(4)	Transitive comp.	unbounded	no/unbounded
(5)	*bi*-comp.	bounded	yes/bounded
(6)	*bi*-comp.	bounded	no/unbounded
(7)	*bi*-comp.	unbounded	yes/bounded
(8)	*bi*-comp.	unbounded	no/unbounded

Table 6.4: The 8 conditions of the AP experimental items

Variable 1: Sentence type

Similar to the VP, this study tests two types of comparatives in the AP domain, namely the transitive comparative and the *bi*-comparative. The transitive comparative is postulated to select only bounded predicates, and the *bi*-comparative with no restrictions. The following pair shows the contrast between the selectional restrictions of the transitive comparative and the *bi*-comparative with the same lexicalization.

(11)   chenyi kuan dayi
       shirt   wide coat
       Predicted to be unacceptable: 'The shirt is wider than the coat.'

       Condition 4: transitive comparative with an unbounded predicate 'wide'

(12)   chenyi bi dayi kuan
       shirt   BI coat wide
       'The shirt is wider than the coat.'

              Condition 8: *bi*-comparative with an unbounded predicate 'wide'

The boundedness constraint predicts that (11) is less acceptable than (12).

Variable 2: Scalar structure

The second manipulation is with the scalar structure. Chapters 2-4 discussed different types of scalar strcture and their compatibility with modification. For example, open-scale adjectives cannot be modified by '100%', as in the unacceptable '*100% tall'. On the other hand, closed scale adjectives are compatible with '100%', since these adjectives denote a boundary, such as '100% full'. With this modification test, one can see whether the adjectives denote an open or closed scale. The acceptability of these expressions is the same in Mandarin:

(13)   baifenzhibai gao
         100%   tall
         '*100% tall'   (*open-scale adjectives*)

(14)   baifenzhibai man
         100%   full
         '100% full'   (*close-scale adjectives*)

For the purpose of this study, this open-closed constrast means the difference in boundedness within the lexical item. Therefore, manipulating the scalar structure would inevitably require changing the lexical items. Table 6.5 lists all the eight adjectives used in this study:

Lexicalization	Subject	Open-scale	Closed-scale	Standard of Comparison
1	shirt	*kuan* 'wide'	*gan* 'dry'	coat
2	table	*gao* 'tall'	*xin* 'new'	chair
3	pencil	*chang* 'long'	*zhi* 'straight'	ruler
4	cup	*da* 'big'	*man* 'full'	bottle

Table 6.5: Lexicalizations of the scalar structure of adjectives

In order to keep the sentences with minimal difference, the selection of these adjectives are largely based on whether the pair can modify the same entities. For

example, 'wide' and 'dry' were chosen because they can both modify 'shirt' and 'coat' in plausible context (so that one knows the sentences, if rated unacceptable, are truly judged by the syntactic acceptability), while showing the open/closed distinction in the scalar structure.

The following pair is an example of the scalar structure manipulation:

(15)   chenyi gan dayi yidian
        shirt   dry coat a.little
        Predicted to be unacceptable: 'The shirt is (a little) drier than the coat.'

           Condition 1: transitive comparative with a bounded predicate 'dry'

(16)   chenyi kuan dayi yidian
        shirt   wide coat a.little
        'The shirt is (a little)wider than the coat.'

         Condition 3: transitive comparative with an unbounded predicate 'wide'

This indicates interesting lexical difference between verbs and adjectives in Mandarin. The implications will be discussed in chapter 9.

Variable 3: Measure phrase

Measure phrases such as 'a little' or 'two inches' denote differential functions or intervals on the scales. Therefore, they license the degree of the predicate, i.e. the measure phrase provides the boundary of the scale.

(17)   chenyi kuan dayi yi-dian
        shirt   wide coat a.little
        'The shirt is (a little) wider than the coat.'

Condition 3: transitive comparative with predicate 'wide' bounded by a measure phrase

(18)   chenyi kuan dayi __
        shirt   wide coat __
        Predicted to be unacceptable: 'The shirt is wider than the coat.'

    Condition 4: transitive comparative with predicate 'wide' without a measure phrase

    The boundedness constraint predicts that (17) is more acceptable than (18), because the transitive comparative selects only bounded predicates. On the other hand, the *bi*-comparative is not expected to show the difference in acceptability:

(19)   chenyi bi dayi kuan yi-dian
        shirt   BI coat wide a.little
        'The shirt is (a little) wider than the coat.'

  Condition 7: *bi*-comparative with predicate 'wide' bounded by measure phrase

(20)   chenyi bi dayi kuan
        shirt   BI coat wide
        'The shirt is wider than the coat.'

    Condition 8: *bi*-comparative with predicate 'wide' without a measure phrase
    That is, example (19) and (20) are predicted to be equally acceptable, since the *bi*-comparative structure is not selective in its complement predicates.

6.4.2   Materials in comprehension task

Similar to verbal predicates, all the sentences used in the judgment task also appeared in the comprehension task, including filler items. The picture stimuli are manipulated differently for adjectival predicates, because properties and comparatives do not show the same differences as verbal predicates.

As mentioned above, because the boundedness property in Mandarin adjectives do not involve secondary predicates like verbs, the manipulation of scalar structure requires changing the lexical adjective, such as *da* 'big' (open scale) vs. *man* 'full' (closed scale). This difference between verbs and adjectives also affects the manipulation in the picture stimuli. For verbal predicates, the presence of secondary predicates still provides the event boundary along the temporal scale and the same set of pictures can be used. For adjectives, however, changing the adjectives would involve change in meaning and require a different set of picture. Therefore, each adjective (in the scalar struture manipulation) would have its own set of pictures. For closed scale adjectives, the pictures are summarized as follows. This is illustrated by the pictures corresponding to sentences like (21).

(21)   chenyi bi dayi gan (yi-dian)
        shirt   BI coat dry a.little
        'The shirt is (a little) drier than the coat.'

In table 6.6 above, stimulus types #1 and #3 show literal reading of 'a little'. Selecting one of these pictures can be interpreted that participants prefer the reading of smaller difference between the target and the standard, because they understand *yi-dian* 'a little' literally (that is, whenever *yi-dian* is present). Type #1 differs from #3 in that the target in the former is completely dry, which indicates a preference to interpret the adjective with a absolute standard. A response to type

Picture Stimulus	Expected Interpretation
Type #1	Literal interpretation of *yi-dian* and absolute reading for Adj
Type #2	'Dummy' interpretation of *yi-dian*
Type #3	Literal interpretation of *yi-dian* and relative reading for Adj
Type #4	Wrong interpretation
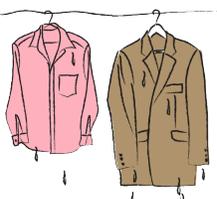
Table 6.6: Picture Stimuli for the Comprehension Task in Bounded Adjectives

#3 would indicate the preference for a looser reading for *gan* 'dry'. In stimulus type #2, the contrast of 'dryness' between the target and the standard is much greater. Selecting this type indicates that the participant does not interpret the *yi-dian* in its literal sense. A type #4 (distractor) response would be considered a wrong interpretation, since it indicates the opposite of what the sentences mean.

It is important to note that the sentence stimuli can be considered ambiguous, and more than one picture is possible. In the instruction, participants were told

that they are expected to choose the 'most suitable' answer without worrying which one is correct or wrong.

For open-scale adjectives, such as *kuan* 'wide' in (22), the contrast between the four picture cues are similar. Type #1 and #3 show literal reading of *yi-dian*. However, due to the semantic nature of open-scale adjectives, there is for instance no such reading for 'absolutely wide'. There are nevertheless two separate pictures for these adjectives for consistency reasons. Type #2 picture stimuli in open scale adjectives are similar to those in closed scale adjectives. The target object is, for example, much wider than the standard of comparison. Similar to other predicates, the type #4 picture stimuli are distractors.

(22)   chenyi bi dayi kuan (yi-dian)
        shirt   BI coat wide a.little
        'The shirt is (a little) wider than the coat.'

Table 6.7 below shows the four picture types used for experimental sentences with an open scale adjective.
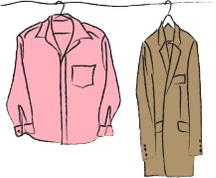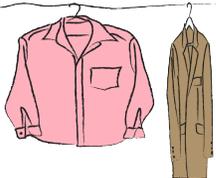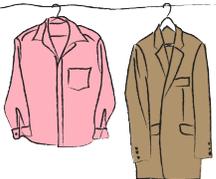
Picture Stimulus	Expected Interpretation
Type #1	Literal interpretation of *yi-dian*
Type #2	'Dummy' interpretation of *yi-dian*
Type #3	Literal interpretation of *yi-dian*
Type #4	Wrong interpretation

Table 6.7: Picture Stimuli for the Comprehension Task in Unbounded Adjectives

7. EXPERIMENTAL RESULTS

7.1 Ratings of filler items as benchmark for acceptability

The filler items were divided in three groups: good, medium and bad in terms of their acceptability. The categories were decided based on the pilot study (5 participants, data not included in this study). After the pilot, the filler items were sorted by their acceptability ratings. The items with lowest mean rating from the pilot are grouped to the 'bad' category presented here. The ratings of these items by the twenty-three experimental participants are then used as benchmark for interpreting the three levels of acceptability in experimental items[1].

Fig. 7.1 shows the acceptability ratings of the filler items.

Welch two sample t-tests[2] were conducted to test the significance of the difference between conditions. The results show that all three groups are significantly different. The good fillers (M = 6.72, SD = 0.68) are significantly more acceptable than the medium fillers (M = 4.85, SD = 1.99), $t(721.39) = 20.46$, $p < 0.0001$. The medium fillers are significantly more acceptable than the bad fillers (M = 2.80, SD = 1.70), $t(1065.50) = 18.27$, $p < 0.0001$. The good fillers are significantly more acceptable than the bad fillers, $t(735.80) = 48.06$, $p < 0.0001$. The output of the statistics from R (R Development Core Team, 2008) and the full list of all the pairwise comparisons can be found in appendix **??**.

---

[1]Note that the 7-point Likert scale in the acceptability task allows ratings from 1 to 7, while 0 is not an option. The y-axis representing ratings in the figures therefore starts with 1 and not 0.

[2]The total number of filler sentences is 64, which is the same as the number of experimental items. This study divides the fillers into three conditions (*good*, *medium* and *bad*), following Francis et al. (2015). Therefore, the number of stimuli per condition are not balanced and it is impossible to conduct paired t-test for filler sentences.

Mean Ratings – Fillers
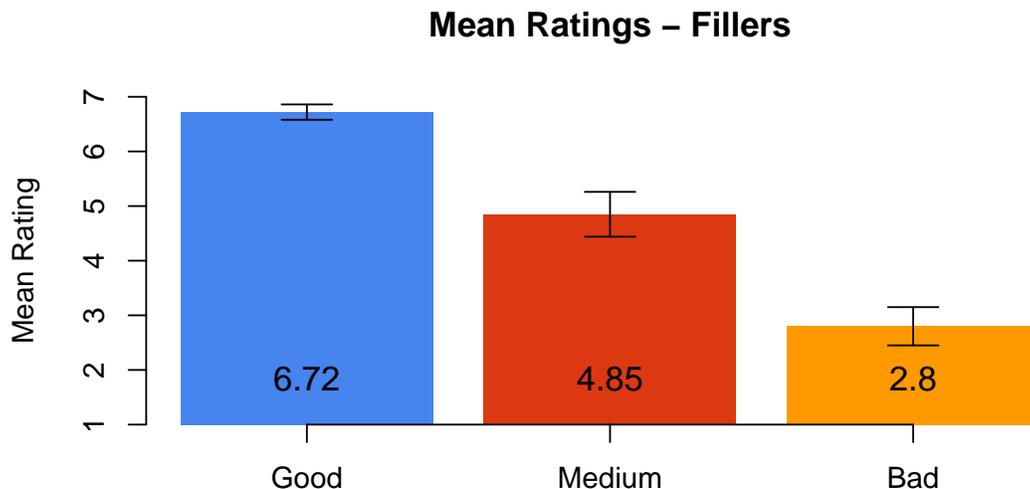
Figure 7.1.: Acceptability ratings of Fillers

Taken together, these results suggest that participants rated the filler sentences in the same way as they are assigned in the three predetermined groups. In addition, the ratings show that the three groups are distinct from each other in terms of their acceptability.

The error bars in this study are based on the standard error of the mean.

7.2   Results of acceptability judgment task

7.2.1   Verbal predicates

The *ba*-construction

Fig. 7.2 shows the means (plus or minus one standard error) for the *ba* sentences.

Mean Ratings – ba
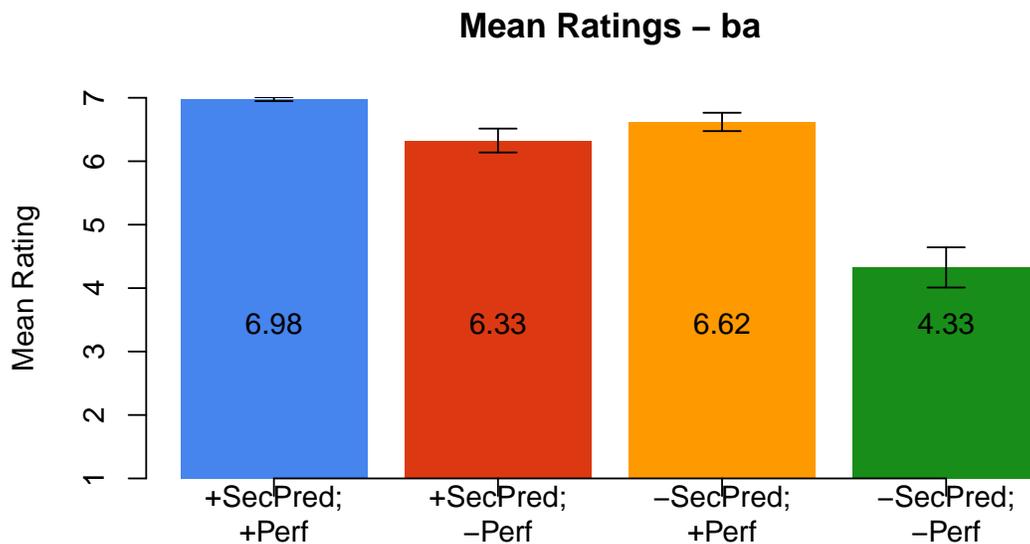
Figure 7.2.: Acceptability ratings of ba-construction

Paired-samples t-tests were conducted to compare among the four conditions. Condition 1 (M = 6.98, SD = 0.15), condition 2 (M = 6.33, SD = 0.90) and condition 3 (M = 6.62, SD = 0.69) all received significantly higher ratings than condition 4 (M = 4.33, SD = 1.52). Condition 1 is more acceptable than condition 4 (t(22) = 10.967, p < 0.001). Condition 2 is more acceptable than condition 4 (t(22) = 8.3542, p < 0.001). Condition 3 is more acceptable than condition 4 (t(22) = 8.7103, p < 0.001).

These results therefore confirm the hypothesis that *ba*-sentences with a bounded predicate is more acceptable than with unbounded predicates. Due to small sample size (23 participants and each participant had four trials), we do not expect that the difference in acceptability can be detected between conditions 1 and 2,

between conditions 1 and 3 and between conditions 2 and 3[3]. Therefore, the numerical differences between these pairs will not be discussed. More details can be found in appendix **??**.

The canonical SVO sentence

Fig. 7.3 shows the acceptability ratings of the canonical SVO order. The SVO word order does not display the same constrast as the *ba*-constuction in terms of boundedness. All four conditions in SVO receive ratings around 6. The greatest difference in mean rating is between the first condition (M = 6.90, SD = 0.39) and the second condition (M = 5.99, SD = 1.18). However, this difference is lower than 1. Due to the number of participants and trials, the dataset does not have the power to tell the difference between this smaller effect.

To focus on the constrast between *ba*-construction and SVO order, fig 7.4 shows the difference between the two sentence structures in the absence of the secondary predicate and perfective *le*. Comparing predicates that are unbounded (i.e. with neither secondary predicate nor perfective marker *le*), the paired t-test indicated that *ba*-construction is significantly lower than the SVO order, $t(22) = 8.5202$, $p < .001$.

7.2.2 Adjectival predicates

Figures 7.5 and 7.6 show the results for *bi*-comparatives and transitive comparatives, respectively.

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[3]Following the Purdue Statistics Consulting for Gökgöz (2013), the minimum difference between ratings to be considered significant is 1.5 on a 7-point Likert scale, given that the number of participants is 17.

Mean Ratings – SVO
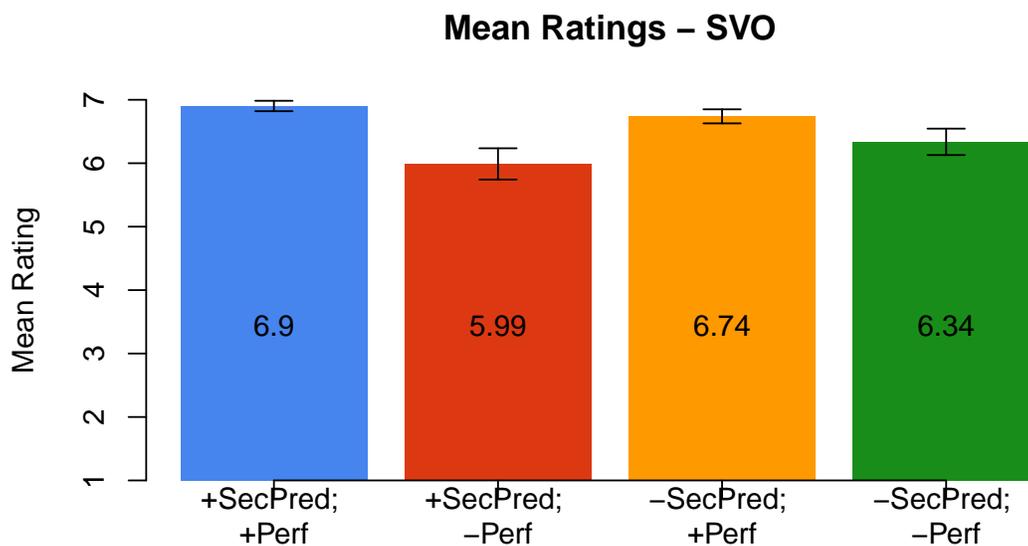
Figure 7.3.: Acceptability ratings of SVO

In *bi*-comparatives, all four conditions receive high ratings, regardless of the scalar structure of the adjectives or the presence of measure phrase.

None these four conditions show significant difference in acceptability with the good fillers.

The condition closed scale adjective (e.g. *man* 'full') with measure phrase in *bi*-comparative has a mean rating 6.76 (SD = 0.59). Close scale adjectives without measure phrase receive mean rating 6.83 (SD = 0.43). Open scale adjectives (e.g. *da* 'big') with measure phrase have mean rating of 6.93 (SD = 0.23). Open scale adjectives without measure phrase have a mean rating of 6.82 (SD = 0.49).

For transitive comparatives (fig. 7.6), the presence of measure phrases *yi-dian* contributes to higher acceptability ratings.

With a closed scale adjective (e.g. *man* 'full') and a measure phrase *yi-dian*, the mean rating is 4.48 (SD = 2.08). With an open scale adjective (e.g. *da* 'big')

Mean Ratings – Unbounded Predicates
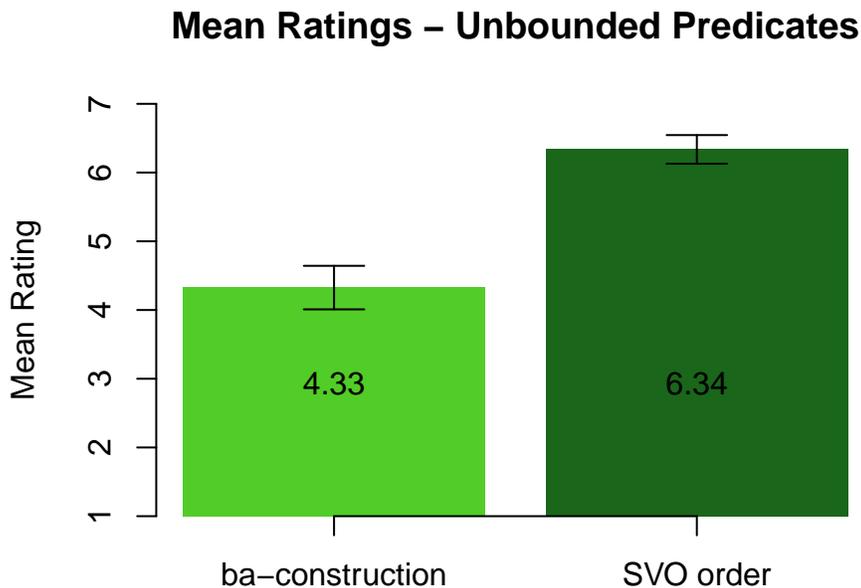
Figure 7.4.: Acceptability ratings of unbounded predicates

and a measure phrase *yi-dian*, the mean rating is 6.02 (SD = 1.22). Sentences with closed scale adjectives and no measure phrase receive a mean rating of 2.38 (SD = 1.72). Sentences with open scale adjectives and no measure phrase receive a mean rating of 3.28 (SD = 1.81).

Paired t-test shows that condition 1 with closed-scale adjective and measure phrase is significantly more acceptable than condition 2 ($t(22) = 8.4291$, $p < 0.001$). Similarly, condition 3 is more acceptable than condition 4 ($t(22) = 9.4447$, $p < 0.001$. Taken together, we can conclude that the presence of a measure phrase is preferred, regardless of the scale structure of the adjective.

Moreover, paired t-test shows that condition 3 is significantly more acceptable than condition 1 ($t(22) = 7.9223$, $p < 0.001$). Similarly, condition 4 is more acceptable than condition 2 ($t(22) = 5.1189$, $p < 0.001$. Taken together, we can conclude

Mean Ratings – bi comparative
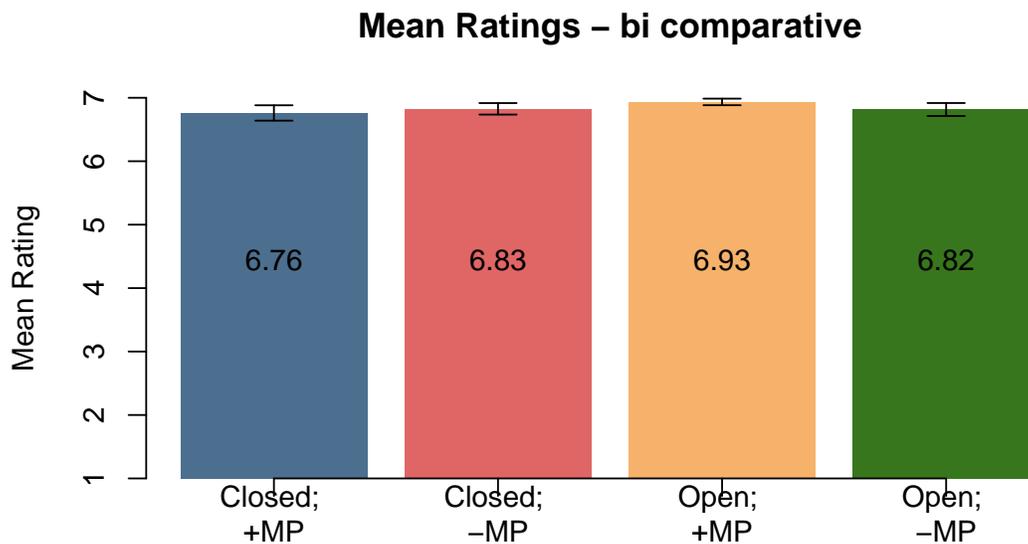
Figure 7.5.: Acceptability ratings of bi-comparatives

that the use of open scale adjective (conditions 3 and 4) are preferred to closed scale adjectives (conditions 1 and 2), regardless of the presence of measure phrase.

7.3 Results of comprehension task

7.3.1 Verbal predicates

Fig. 7.7 shows the distribution of the selected picture in the comprehension task for verbal predicates. Across the two sentence types (*ba* and SVO), most participants choose the picture showing completed events, whenever there is a secondary predicate or perfective *le*, or both. In contrast, two conditions stand out from the other six conditions. The two conditions are the *ba*-construction and SVO sentence with neither a secondary predicate or perfective *le*, i.e. the predicates in these conditions are completely unbounded. In response to these

Mean Ratings – transitive comparative
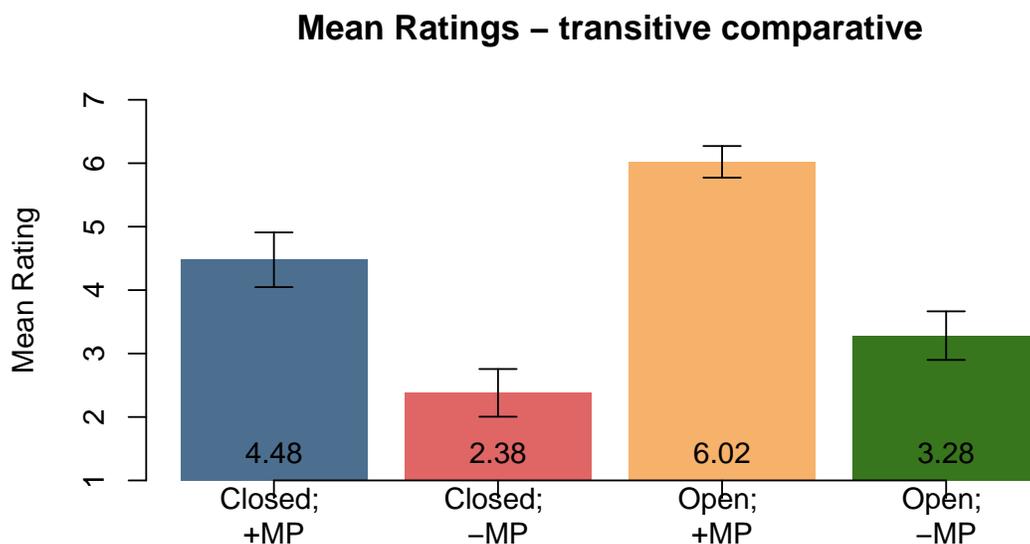
Figure 7.6.: Acceptability ratings of transitive comparative

two conditions, most participants choose the ongoing events. In condition 4 (*ba*; -secondary predicate; -perfective), the picture showing ongoing events is chosen 92.71% out of the 92 observations[4]. In condition 8 (SVO; -secondary predicate; -perfective), the 'ongoing' picture is chosen 96.74% of the time (n = 92). This pattern helps support the hypothesis that Mandarin speakers are sensitive to the boundedness markers. The absence of secondary predicate and perfectively *le* contributes to the participants choosing the picture that indicates the ongoing interpretation.

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[4]In the acceptability judgment task, the statistics are reported based on the 23 participants and the mean score by condition. Since the picture selection data are categorical, the four lexicalizations for the participants are not averaged and the number of observations for each conditions is 92, i.e. 23 participants × 4 trials.
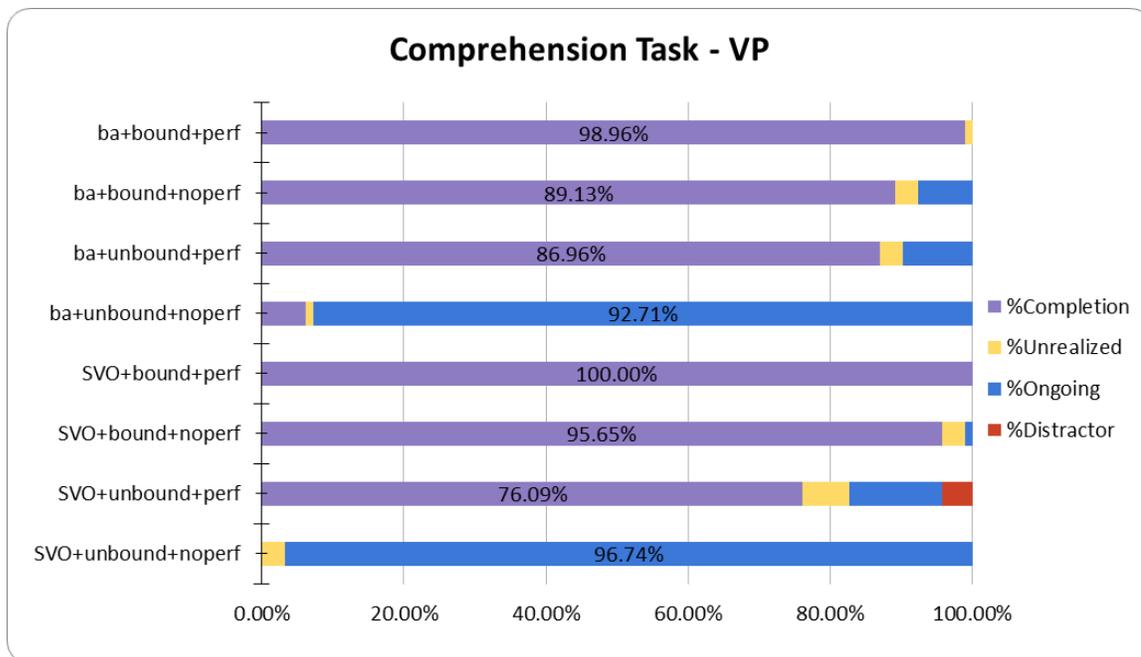
Figure 7.7.: Comprehension task in the VP

7.3.2 Adjectival predicates

Fig. 7.8 shows the distribution of the selected picture in the comprehension task for comparatives.

The closed scale adjectives do not show any patterns or interactions, regardless of the presence of measure phrase or the sentence type they appear in. For open scale adjectives, the presence of measure phrase contributes to more tokens of picture #2 (shown in the blue bar in the figure, the bar is moved toward the right for illustration purpose), regardless of the sentence type.

7.4 Summary

To summarize, the experimental data shows the following patterns:
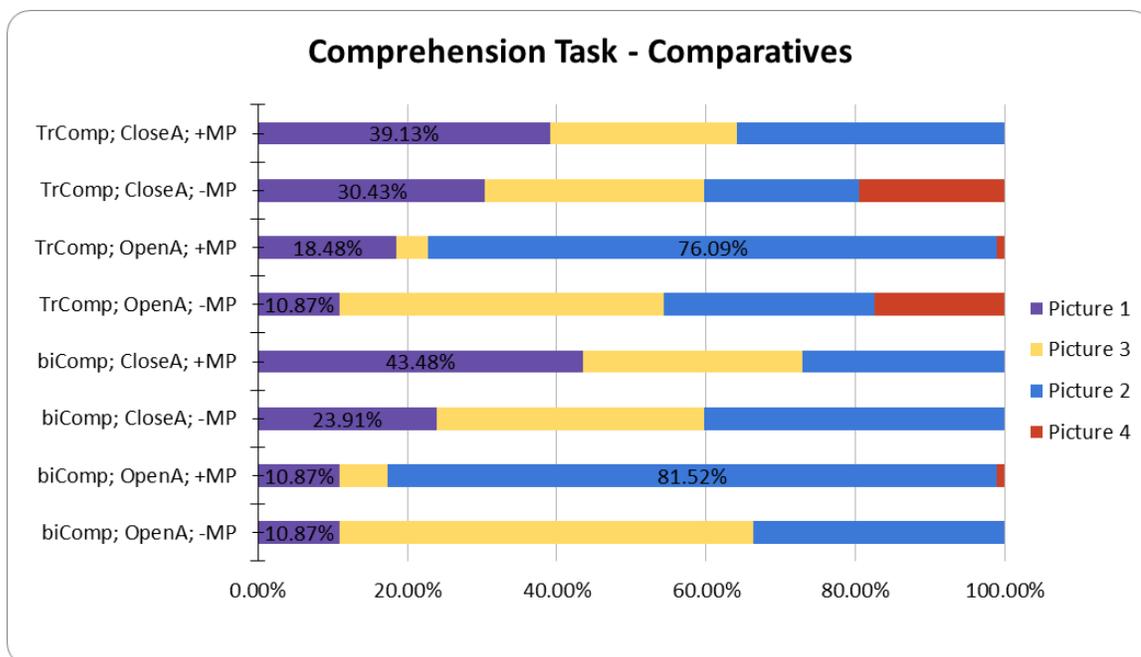
Figure 7.8.: Comprehension task in Comparatives

1. The ratings of filler items are used as a reference for good (i.e. acceptable), medium and bad (less acceptable) sentences.

2. The *ba*-construction with unbounded predicates (i.e. with no secondary predicates nor perfective *le*) show lower ratings than predicates bounded by at least one marker.

3. The canonical SVO order is acceptable in all four conditions and does not show any (dis)preference to boundedness of the predicates.

4. The *bi*-comparative is unselective in boundedness of the adjectival predicates. The scalar structure of the adjective or the presence of measure phrase *yi-dian* does not affect the acceptability of *bi*-comparatives. All four conditions are highly acceptable.

5. For transitive comparatives, the only combination that receives a rating of acceptable sentence is the open scale adjectives with a measure phrase. Closed scale adjectives result in lower acceptability ratings, even with a measure phrase. Without a measure phrase, the transitive comparatives is unacceptable, regardless of the scalar structure of the adjectives.

6. In the comprehension task, the choice of picture shows that participants are sensitive to the use of secondary predicates (e.g. *wan* 'finish') and perfective *le* for verbal predicates. As for adjective predicates, there is a contrast brought by *yi-dian* 'a little', in that the absense of *yi-dian* correlates to higher number of responses for the picture denoting a larger difference between the target and the standard of comparison.

8. DISCUSSION

8.1   Interpreting boundedness

The responses in the comprehension task have shown that participants are sensitive to boundedness. For verbal predicates, the absence of both secondary predicates and perfective *le* results in the interpretation that the predicate is unbounded, as indicated by the preference for the pictures depicting ongoing events.

For comparatives / adjectival predicates, the data did not show a consistent pattern in terms of the interpretation of boundary. The absence of patterns can be attributed to the systematic difference between events and properties. For events that span over a period of time, it is possible to depict three distinct stages related to the event (i.e. unrealized, ongoing and completion), as the comprehension task did. For comparatives of properties, it is unclear what would be the equivalents of these three stages. For events, the unbounded VPs are interpreted as ongoing events, i.e. the event has begun but has not reached the boundary yet. By analogy, an unbounded comparative would show that the target surpasses the standard by an indefinite amount or extent. This creates a problem in interpreting the picture responses, since three of the pictures can be interpreted this way. To a certain extent, one may consider the two conditions that depict target > standard (i.e. the ones with the literal 'a little' interpretation) as the equivalent of completion in events, because the pictures show the degree associated with the target exceeds the degree of the standard (e.g. the shirt being drier than the jacket).

One can assume that the measure phrase *yi-dian* is ambiguous. Participants' choice between the literal reading and the 'dummy' (purely grammatical) read-

ing of *yi-dian* reflects the boundedness interpretation. The literal reading of *yi-dian* correlates to the bounded reading, since the participants take *yi-dian* as a marker of the extent or difference between the target and the standard. Based on the alternative 'dummy' reading, participants take *yi-dian* only as a formal requirement and the measure phrase does not force them to respond with the pictures showing the 'a little' reading. This is similar to the behavior of the use of *hen* 'very' in positive adjectives, in the sense that 'very' is not necessarily interpreted literally as emphasis. What it means is that the *yi-dian* is interpreted more as a formal requirement than a literal measurement. One might then wonder why this is the case. This question will be addressed in section 8.5.2, in which we discuss why the measure phrase is obligatory for transitive comparatives and how it relates to the loss of literal meaning of *yi-dian*.

The contrast in open scale adjectives can be seen as supporting evidence for this theory. Regardless of the sentence type, open scale adjectives with the measure phrase result in more responses for the bounded reading than the same adjective without measure phrase. This shows that while the presence of the measure phrase is ambiguous, the absence of it correlates to a higher number of unbounded readings. There is, therefore, reason to assume that participants are in fact sensitive to the boundedness distinction in comparatives.

The take-home message from the comprehension task is that the differences in acceptability are linked to the interpretation of boundedness and the presence of the boundedness of the predicates.

8.2 Prediction 1: Selection of bounded predicates

The boundedness hypothesis and the four predictions are restated below.

(1) **Boundedness constraint**: The morpheme *Deg* in Mandarin selects comple-
ment predicates based on their boundedness.

- **Prediction 1**: *ba* and transitive comparatives select bounded predicates

- **Prediction 2**: SVO and *bi* do not select predicates by boundedness

- **Prediction 3**: Deg^0 shows similar selectional behaviors across VP and AP

- **Prediction 4**: Transitive comparatives are highly constrained

8.2.1 The *ba*-construction

The first component of the hypothesis is that *ba* and the transitive comparative
both select the bounded predicates only. This hypothesis is confirmed by the
experimental data.

Verbal predicates that are not bounded by either a secondary predicate or
the perfective *le* are less acceptable than their bounded counterparts in the *ba*-
construction. The results also show that *ba* is only selective as long as the predicate
is bounded once. In the two conditions where the predicates are bounded once
(by secondary predicate or perfective *le*), the sentences are both as acceptable as
the good filler sentences. Therefore, boundedness here is a non-gradient, binary
notion, in the sense that the presence of two boundedness markers do not make
the predicate 'more bounded'.

Semantically, this non-gradient notion for boundedness is congruent with pre-
vious studies. Recall the discussion in chapter 2. Lipenkova (2011) proposes (2),
which states that the morpheme *ba* takes an event *e* that associates with a scale *s*,
and the extent function associates the scale and event to the degree *d*.

(2) $[\![ba]\!] = \lambda P_{\langle e, \langle e, t \rangle \rangle} \lambda y \lambda x \lambda s \lambda d \lambda e. P(x)(y)(e) \wedge scale(s)(e) \wedge extent(s)(d)(e)$

Denotation (2) shows that the extent function can be satisfied by scale and degree in more general terms and not only temporal scales. This formulation of *ba* leads us to generalize the degree-restriction of the *ba*-construction to another functional category, namely the transitive comparatives.

Since our data confirm that the selectional property of *ba* is based on boundedness, we can formulate the following structure (3) for *ba*-construction, building on the syntax in Huang et al. (2009); Ernst (2010) and Lipenkova (2011)'s semantics.

(3)
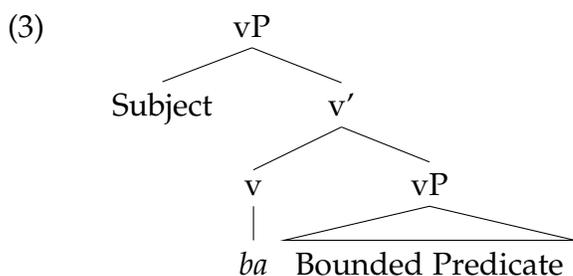
In (3), *ba* takes vP as its complement following Huang et al. (2009). Taking the semantics in (2) together, this means the lower vP must contain the contents of extent and scale. Based on the experimental results, we take both secondary predicates and perfective *le* as boundedness markers, which can be seen as supplier of *d*. The scale associated with the event can be supplied lexically by the verb. In most cases, the scale associated with the verb is encoded in the verb, because it is part of the idiosyncratic, lexical meaning. Alternatively, the scale and the degree can be supplied by the direct object. The experiment did not test the effect of determiner or number of the direct object, because it is generally accepted that the quantized or definite noun phrases would contribute to a bounded reading of the predicates in Mandarin and other languages (cf. Hay et al. (1999)).

Language-specifically, this analysis provides a natural explanation to why intentional adverbs can appear after *ba*, despite the fact that sentential subjects always precede *ba*.

(4) wo ba ta **gu-yi**   zhi   kai
     1sg BA 3sg intentionally send away
     'I sent him/her away on purpose.'

Following the event decomposition in Ramchand (2008), the initiator is introduced by the init^0, which can be seen as an equivalent of the v^0. The complement of init^0 is procP, which does not introduce the external argument and is equivalent of VP. Since the complement of *ba* is a full-blown vP, it may contain the agent (in a broader sense) of the predicate. This also allows intentional adverbs like *gu-yi* 'intentionally; on purpose' to properly modify the vP. If one were to analyze the complement of *ba* as a VP, which does not include the external argument, sentence (4) would require additional stipulation. The present split-vP analysis provides a principled explanation in terms of boundedness, as well as an analysis that fully explain the empirical data. Chapter 9 will further discuss the theoretical implication of this split-vP analysis.

8.2.2   The transitive comparative

The transitive comparative is also hypothesized to be selective in terms of boundedness, as shown in (5).

(5)
```
                    DegP
                  /      \
            Target        Deg'
                        /      \
                     Deg        DegP
                      |        /     \
                   TrComp   Bounded Predicate
```
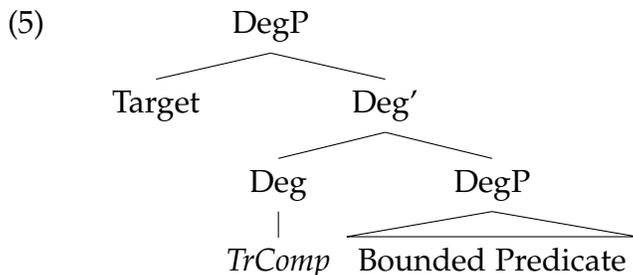
The experimental results confirm two observations regarding transitive comparatives. First, the measure phrase is in fact required for the transitive comparatives,

as evidenced by the contrast in acceptabilty in figure 7.6. Specifically, the presence of measure phrase contributes to a higher acceptability rating across both types of adjectives tested. This measure phrase restriction can be explained straightforwardly by the boundedness hypothesis. Since measure phrases represent the differential function and therefore provide the boundary for the comparison, the fact that the measure phrase must be present indicates that there must be a boundary.

Potentially, there are two possible analyses for the transitive comparatives. A selectional account in (6) would have been consistent with its verbal counterpart for the *ba*-construction, by positing a silent morpheme that selects the sequence [Standard–Adjective–Measure Phrase] as its complement. However, since the standard of comparison always follows the adjective. The selection by null Deg^0 in (6) would make the wrong prediction. The surface word order of transitive comparative therefore motivates a head-movement account in (7) instead.

(6)   Selection by null-TrComp
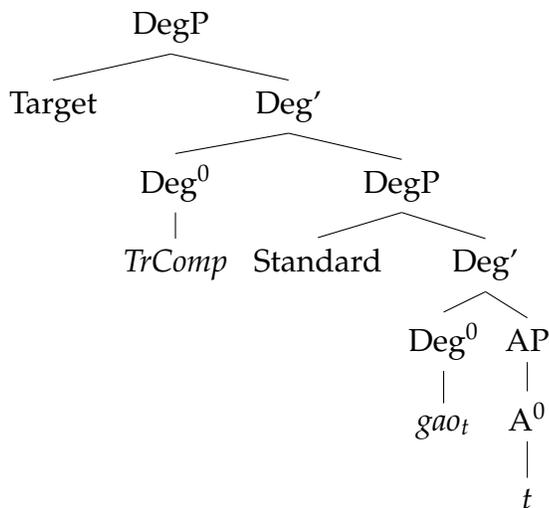
(7)   Movement to null-TrComp

$$
\begin{array}{c}
\text{DegP} \\
\diagup \qquad \diagdown \\
\text{Target} \qquad \text{Deg}' \\
\diagup \qquad \diagdown \\
\text{Deg}^0 \qquad \text{DegP} \\
| \qquad \diagup \quad \diagdown \\
gao_t \quad \text{Standard} \qquad \text{Deg}' \\
\diagup \quad \diagdown \\
\text{Deg}^0 \quad \text{AP} \\
| \qquad | \\
t \qquad \text{A}^0 \\
| \\
t
\end{array}
$$
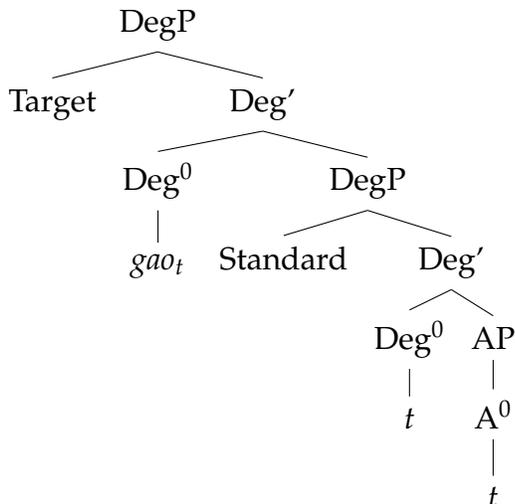
The second observation confirmed in the experiment is related to scalar structure. Only open scale adjectives are allowed in transitive comparatives, and closed scale adjectives are not. With or without the measure phrase, open scale adjectives in transitive comparatives receive higher rating than closed scale adjectives. This poses a challenge to the boundedness constraint. Because closed scale adjectives are supposed to be bounded, it is paradoxical that it cannot appear in the transitive comparative, which is claimed to select only bounded predicates. To solve this problem, this study will resort to a syntactic solution by postulating that the closed scale adjectives are phrases and not heads. That is, the bounded semantics of closed scale adjectives is not a problem for the transitive comparative. It is the syntactic requirement of the transitive comparative that the adjective must undergo A^0-to-Deg^0 movement. As a consequence, since closed scale adjectives are internally complex, they must not undergo head movement to form a transitive comparative. Combining this postulation with the general boundedness constraint, this would also explain why the acceptable transitive comparatives always consist of an open scale adjective and a measure phrase. This movement account will be revisited in the discussion on the internal structure of the bounded

adjectival predicates. Additional data about morphemes of 'exceeding' like *geng* and *chu* will be given in section 8.5.

8.3 Prediction 2: Sentences without $[\![Deg_{bound}]\!]$ are unselective

The experimental results clearly illustrate that boundedness of the predicates do not affect the acceptability of the SVO word order or the *bi*-comparatives. All four types of SVO sentences and four *bi*-comparatives are highly acceptable. The boundedness hypothesis correctly predicts that there is no difference in terms of acceptability for bounded and unbounded predicates in SVO and *bi*-comparatives.

8.3.1 SVO word order

Since the four combinations of the two boundedness markers are acceptable, the proposed structure in (8) shows a regular vP structure, as typically assumed for head-initial SVO languages, including Mandarin.

(8)

```
              vP
          ┌────┴────┐
      Subject      v′
               ┌────┴────┐
              v⁰         vP
               │      ┌───┴───┐
               Ø   (un)bounded predicates
```
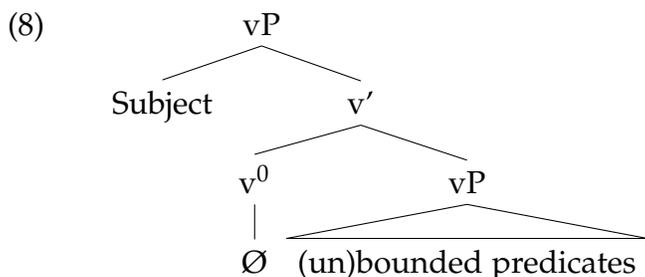
Following the arguments based on adverb placement facts in Huang et al. (2009); Ernst (2010), the present study argues that the lexical verb never moves from within the lower vP to the v^0. Recall examples like (9) and (10).

(9) Lisi (qingqingde) ba zhuozi (**qingqingde**) qiao-le   yixia
     Lisi lightly   BA table   lightly   knock-PRF once
     'Lisi lightly knocked once on the table.'   Ernst (2010, p.180)

(10)   Lisi (qingqingde) qiao-le   (*__qingqingde__) zhuozi (*__qingqingde__) yixia
        Lisi lightly   knock-PRF lightly   table   lightly   once
        'Lisi lightly knocked once on the table.'

The crucial difference is that adverbials may appear before or after *ba*, but only before the verb in SVO. The *ba*-construction indicates that the left-adjunct positions are available in both layers of vP. The fact that the verb in SVO never occurs before the adverbs shows that the verb never moves past its left-adjunct to land on a higher v^0 position. In addition, the comprehension task shows an interpretive contrast between bounded and unbounded predicates in canonical SVO order (and in the *ba*-construction too). This indicates that the unbounded predicates are acceptable also when they are interpreted as unbounded.

8.3.2   The *bi*-comparative

The *bi*-comparative shows a similar unselective pattern. All the combinations of open/closed scale adjectives and presence of measure phrase are acceptable, which indicates that *bi* accepts bounded and unbounded predicates.

(11)

This formulation correctly predicts that unbounded predicates are allowed in *bi*-comparatives like (12).

(12)   beizi bi pingzi { gao / man } (yi-dian)
        cup BI bottle   tall   full   a.little

'The cup is (a.little) {taller / fuller} than the bottle.'

Sentence (12) shows that both open and closed scale adjectives are allowed in *bi*-comparatives. Also, the measure phrase *yi-dian* is optional.

An alternative analysis for the unselective behavior in SVO and *bi* comparative is to posit that there is no higher v^0 or higher Deg^0. However, since the comparative is overtly expressed by *bi*, and *bi* is clearly the morpheme that introduces the comparative, it is impossible to maintain such an analysis that there is no higher Deg^0 in (11).

8.4   Prediction 3: Similar effects for Deg^0 across VP and AP

Sections 8.2 and 8.3 have independently established that the domain-general Deg_{bound} functional morpheme (realized as *ba* and null transitive comparative in VP and AP, respectively) select only bounded predicates in various forms. For the unselective constructions, both SVO and *bi*-comparative show no preference in their predicate complements. The significance of this confirmation is that boundedness can be seen as the underlying common thread between the verbal and adjectival alternations. More precisely, it is the 'selectivity on boundedness' that governs the contrast between *ba* and SVO on the one hand, and transitive comparative and *bi* on the other.

Based on this formulation, it is predictable that modifications demonstrate similar effects on both verbal and adjectival predicates. As discussed in chapter 4, cross-categorial behaviors are common across languages. The measure phrase *yi-dian*, for example, can appear in *ba*-construction (13). Other non-temporal measurement may also act as boundary of the events (14).

(13)   Zhangsan ba shu kan le   yi-dian
           Zhangsan BA book read Perf a.little
           'Zhangsan read a little of the book.'

(14)   Zhangsan ba pingguo yao le   si   kou
           Zhangsan BA apple   bite Perf four mouth
           'Zhangsan took four bites at the apple.' (lit. 'Zhangsan bit the apple by four mouthfuls.')

The acceptable use of *si kou* 'four mouthfuls' shows that the measurement is idiosyncratic and productive, but not idiomatic. Other numbers and measurements are acceptable, as long as they are semantically and pragmatically appropriate.

    Furthermore, the hypothesis that vP and DegP are realizations of a common function brings the benefit of providing a natural explanation to the striking similarity between Mandarin verbs and adjectives in general. For instance, *bing* 'sick' denotes a property and is therefore often considered an adjective. Mandarin allows *bing* to occur in verbal environments, such as co-occurence with aspect markers.

(15)   Zhangsan bing { le   / guo } (yi chang)
           Zhangsan sick   Perf   Exp one time
           'Zhangsan had been sick.'

The inclusion of experiential *guo* shows that this is not an exclusive property of perfective *le*. The measure phrase *yi chang* is optional. When it is present, the sentence entails that Zhangsan is no longer sick, or that he got well at one point. The entailment can be confirmed by the fact that a follow-up 'but s/he still needs to stay at the hospital' sounds self-contradictory. This entailment confirms that the event of being sick must be bounded, similar to the completion reading in the experimental study.

In sum, the hypothesis is partially confirmed. The remaining complication is the additional restriction of transitive comparatives based on scalar structure, which will be further explained in section 8.5.

8.5 Prediction 4: Additional constraints of transitive comparatives

Sections 8.3 and 8.4 mentioned there is a potential challenge from the incompatibility between closed scale adjectives and the transitive comparatives. The transitive comparative is claimed to select bounded predicates, therefore, it is unexpected that the doubly-bounded predicate (16) and the lexically-bounded predicate (17) are not acceptable for the construction.

(16)   *beizi man pingzi yi-dian
        cup   full bottle a.little
        'The cup is fuller than the bottle.'   (bounded with closed scale adjective
        and measure phrase)

(17)   *beizi man pingzi
        cup   full bottle
        'The cup is fuller than the bottle.'   (bounded with closed scale adjective
        and without measure phrase)

From the experimental results, one can see that transitive comparative sentences are more constrained than the corresponding verbal counterpart *ba*-construction. Here I argue that this does not refute the boundedness hypothesis. Rather, in addition to the boundedness hypothesis, the explanation relies on (i) the lexical constraint for Mandarin adjectives and (ii) the construction-specific head movement. It is the conspiracy among these three constraints that causes the transitive comparative construction to select only open scale adjectives and measure phrase as its complement predicate. To recapitulate, two observations were made from

the experimental results. First, the transitive comparatives must take a measure phrase, as shown directly by the lower ratings in transitive comparatives without measure phrases. Second, the use of closed scale adjectives results in a lower acceptability rating regardless of the presence of measure phrase, despite the inherent boundedness of closed scale adjectives.

With all the adjectives being acceptable in *bi*-comparatives, it is clear that all the adjectives used are in fact gradable and can be used in comparatives. Therefore, the unacceptability of some of the transitive comparatives must be explained in non-lexical ways. I posit that the unacceptability comes from the syntax of transitive comparatives. The crucial difference between *bi* and transitive comparatives is the different Deg^0. Specifically, transitive comparatives are hypothesized to derive from head movement. The head movement operation is hypothesized to be the cause of the unacceptability. Essentially, this study hypothesizes a lexical AP-shell analysis, which posits that adjectives are internally complex and they may spell out syntactic elements larger than a head, similar to decompositional 'VP-shell' analyses for verbs.

Section 8.5.1 will discuss data from the interactions between transitive comparatives and other boundedness morphemes like *geng* and *chu*. By establishing a more detailed analysis regarding the lower DegP, the section will show that closed scale adjectives are acceptable in various types of comparatives, as long as they do not have to undergo head movements.

A corollary is that the obligartory status of measure phrases would receive a natural explanation. Since closed scale adjectives may not undergo head movement, the only option left to create a bounded predicate is the use of measure phrase. This will be further elaborated in section 8.5.2.

8.5.1 Transitive comparatives interacting with *geng* and *chu*

In chapters 2–4 on previous studies, it has been argued that both *bi* and transitive comparatives are heads of a higher DegP, and the Adjective moves to the lower DegP in all cases to provide the comparative interpretation. Following Guo (2012), this study assumes that *chu* 'exceed' is an affix that merges with the adjective when the latter raises from A^0 to Deg^0. Under this assumption, sentences (18) and (19) can be explained under the same structure (20). The dotted line shows the head movement in the case of transitive comparatives.

(18) ta-de   fenshu bi pingjun-fen gao (chu) hen duo
      3sg-POSS score   BI average.score high EXCEED very much
      'His score is much higher than the average.'

(19) ta-de   fenshu gao (chu) pingjun-fen (*chu) hen duo
      3sg-POSS score   high EXCEED average.score EXCEED very much
      'His score is much higher than the average.'
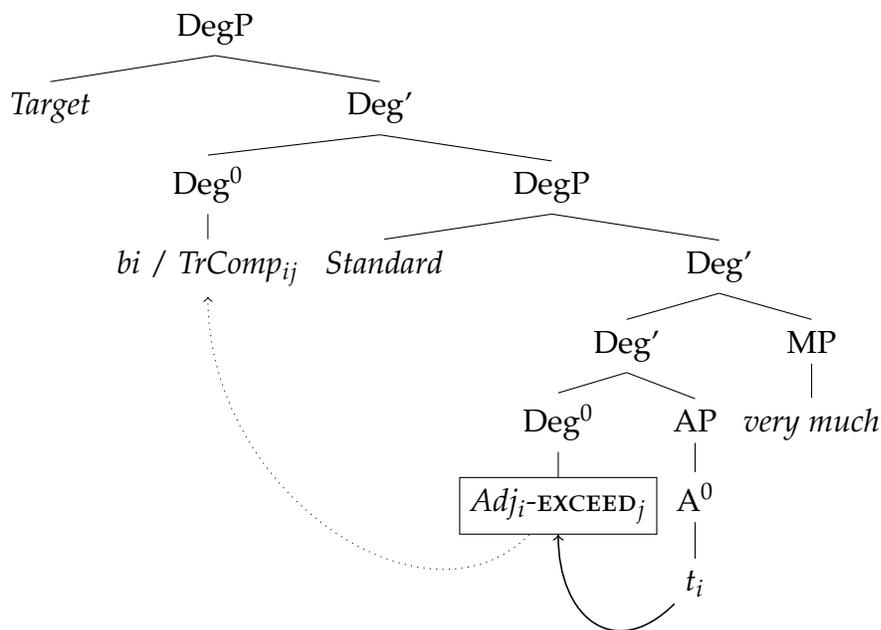
(20)

Since *chu* must always follow the adjective immediately, as shown in (19) with the unacceptable placement after the standard, *chu* should be analyzed as an affix at the lower Deg^0. Another motivation for the suffixal *chu* is that *chu* can never precede the adjective, as in (21), nor its counterpart in the transitive comparative.

(21)   *ta-de   fenshu bi pingjun-fen   chu   gao hen duo
       3sg-POSS score   BI average.score EXCEED high very much
       Intended: 'His score is much higher than the average.'

From the surface order, the Mandarin data do not immediately indicate at which level the measure phrase 'very much' adjoins. However, since it must be present in comparatives with *chu* (even in *bi* sentences), it seems more reasonable to posit that the measure phrase adjoins at the lower DegP. This treatment is also more congruent with the main claim in this study, in which the silent transitive comparative morpheme (*TrComp* in (20)) selects bounded predicates.

Based on this analysis of *chu* 'exceed', there is only one possibility to derive the correct word order and interpretation, which is a head movement account for the adjective. Keeping the structure unchanged, the counterparts of (18) or (19) with a typical closed scale adjectives are not acceptable.

(22)   ta-de   beizi bi wo-de   beizi man (*chu) hen duo
       3sg-POSS cup   BI 1sg-POSS cup   full EXCEED very much
       'His cup is much fuller than mine.'

(23)   *ta-de   beizi man (chu)   wo-de   beizi (chu)   hen duo
       3sg-POSS score full EXCEED 1sg-POSS cup   EXCEED very much
       'His cup is much fuller than mine.'

Regardless of *bi* or transitive comparatives and the position of *chu*, the presence of *chu* results in an unacceptable sentence. Since *chu* 'exceed' is the immediately dominating head to the AP, the contrast in acceptability between the pairs (18)–

(22) and (19)–(23) must be attributed to the internal structure of these adjectives, i.e. that closed scale adjectives constitute a unit that is not a head, such that head movement is illicit.

The crucial point with *chu* 'exceed' is that it attracts head movement to fill the lower Deg^0 in both *bi* and transitive comparative. In the case of transitive comparative, the Adj-EXCEED cluster further raises to the higher Deg^0, as shown in (20).

Alternatively, one may argue that *chu* simply acts as a suffix to adjectives and occurs exclusively with open scale adjectives for lexical or semantic reasons. However, there is no independent reason for this position. Also, the further data with *geng* 'more' will show that the lower DegP analysis is a better option, in order to keep the comparative interpretation properly licensed.

Sentences (24) and (25) show the other comparative licensing morpheme *geng*, which is incompatible with the transitive comparative.

(24)   Zhangsan bi Lisi (geng) gao
          Zhangsan BI Lisi more   tall
          'Zhangsan is taller than Lisi.'

(25)   Zhangsan (*geng) gao Lisi   (*geng) yi-dian
          Zhangsan more   tall exeed Lisi   a.little
          'Zhangsan is a little taller than Lisi.'

The morpheme *geng* can take closed scale adjectives in *bi*-comparatives (26), but not in transitive comparatives (27):

(26)   beizi bi pingzi (geng) man
          cup   BI bottle more   full
          'The cup is fuller than the bottle.'

(27)   beizi (*geng) man pingzi (*geng) yi-dian
          cup   more   full bottle more   a.little

'The cup is fuller than the bottle.'

This contrast between *geng* and *chu* can be explained in terms of whether they allow adjective raising to the lower Deg^0. In structure (28) with *geng* in the lower Deg^0 as the functional head (and not an affix), the adjective always remains in its base-generated position. The morpheme *geng* is treated as a functional head, because it allows both open and closed scale adjectives in *bi*-comparatives, as shown in (24) and (26).
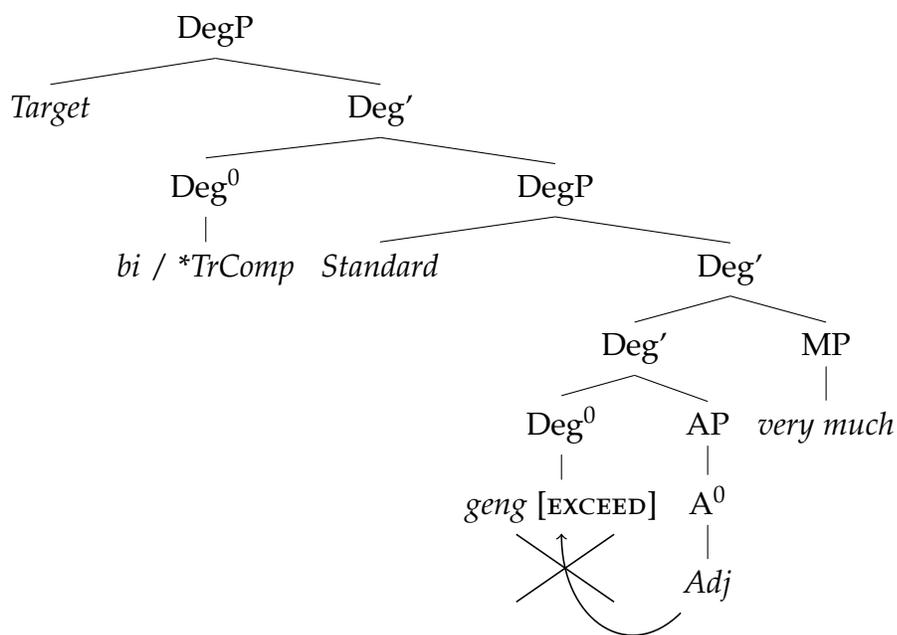
(28)

Table 8.1 summarizes the differences between *chu* and *geng*.

	chu	*geng*
bi + Adj$_{open}$	*bi* Std Adj$_{open}$ *chu*	*bi* Std *geng* Adj$_{open}$
bi + Adj$_{close}$	**bi* Std Adj$_{close}$ *chu*	*bi* Std *geng* Adj$_{close}$
TrComp + Adj$_{open}$	Adj$_{open}$ *chu* Std	**geng* Adj$_{open}$ Std
TrComp + Adj$_{close}$	**Adj$_{close}$ *chu* Std	**geng* Adj$_{close}$ Std

Table 8.1: Differences between *chu* and *geng*

The first and the fourth rows do not provide new information. Since *bi* is not selective, it is not surprising that both *chu* and *geng* are acceptable. Transitive comparatives do not allow closed scale adjectives, which is also expected.

The second row shows that even with *bi* at higher Deg^0, the closed scale adjective is still unacceptable with *chu*. That means the unacceptability must come from *chu*. Taken with row 4 in table 8.1, one can see that *chu* does not allow closed scale Adjectives at all. This is predicted by the affix analysis in structure (28). On the other hand, *geng* is acceptable with closed scale adjectives only in *bi*-comparative (row 2), but not in transitive comparatives (row 4). This is predicted by the non-movement with *geng*.

In the third row, the Deg^0 with [*chu–Adj*] is free to move in transitive comparative or stay in Deg^0 with *bi* (cf. structure (28)), given that the open scale adjective is allowed to raise to begin with. For *geng* with open scale adjectives, since [*geng–Adj*] would constitute the DegP, it is also predictably illicit in transitive comparatives.

The *chu* and *geng* data reveal that the lower DegP is in fact compatible with all adjectives, and not only open scale adjectives. This confirms the hypothesized syntactic distinction between open (head) and closed (phrasal) scale adjectives.

There are two immediate corollaries from the discussion about the lower DegP above. First, the lower Deg^0 analysis for *geng* also captures the fact that implicit comparisons can be expressed in (29).

(29) Zhangsan (geng) gao
      Zhangsan more   tall
      'Zhangsan is taller.' (Not: 'Zhangsan is tall.')

It is well established in the literature that without the degree specification such as *hen* 'very', sentences like *Zhangsan gao* would be interpreted as implicit com-

parison. It is therefore reasonable to treat *geng* and the implicit degree as two instantiations of the lower Deg^0. This provides a direct mapping between the syntax and their semantics.

A second corollary of this unified structure is that it also allows *geng* to take VP as its complement. This is fully compatible with Erlewine (2007, 2013). The unified structure shows that *geng* and the null EXCEED morpheme in regular transitive comparatives are simply allomorphs to each other. The interpretation of (30) remains the same with or without *geng*.

(30)   Zhangsan bi Lisi (geng) xihuan kan dianying
        Zhangsan BI Lisi more   like   see film
        'Zhangsan likes watching movies more than Lisi.'

Table 8.2 is a quick summary of the landscape of lower DegP in Mandarin and its relation with the higher DegP. Since the null EXCEED and *chu* involve movements to the lower Deg^0 (given the caveat that only open scale adjectives are allowed to move), EXCEED and *chu* are therefore compatible with both *bi* and transitive comparatives. Examples (31) and (32) show the simple case of null EXCEED.

Lower Deg^0	Syntactic operations	Compatibility	Examples
null EXCEED	A^0 →Deg^0, merge with null affix	*bi* & TrComp	(31), (32)
chu 'exceed'	A^0 →Deg^0, merge with suffix *chu*	*bi* & TrComp	(33), (34)
geng 'more'	no movement	*bi* only	(24), (25)

Table 8.2: Summary of different realizations of EXCEED

(31)   Zhangsan bi Lisi gao san-gong-fen
        Zhangsan BI Lisi tall 3cm
        'Zhangsan is 3cm taller than Lisi.'

(32) Zhangsan gao Lisi san-gong-fen
   Zhangsan tall Lisi 3cm
   'Zhangsan is 3cm taller than Lisi.'

8.5.2 Why the measure phrase is obligatory

As mentioned above, the pattern of transitive comparatives is a conspiracy of three independent forces. First, the transitive comparative requires its complement to be bounded predicates. Second, the transitive comparatives requires head movement. Third, adjectives in Mandarin appear to lexicalize as one morpheme (discussed further in chapter 9), regardless of their scalar structure.

This also provides a natural explanation to the obligatory status of measure phrase in transitive comparatives. Since closed scale adjectives are not allowed in transitive comparatives for a syntactic reason, and the transitive comparative construction does require a bounded predicate as its complement, the measure phrase becomes the only option to fulfill the requirement. This is shown in the experimental results that open scale adjectives plus measure phrase is the only acceptable option for transitive comparatives.

Another interesting observation is that the measure phrase must be present whenever *chu* is there. It is not surprising that (33) must have the measure phrase because of the transitive comparative. However, (34) is unexpected since *bi* comparative does not typically require the measure phrase.

(33) Zhangsan gao chu Lisi *(san-gong-fen)
   Zhangsan tall exceed Lisi 3cm
   'Zhangsan is 3cm taller than Lisi.'

(34) Zhangsan bi Lisi gao chu *(san-gong-fen)
   Zhangsan BI Lisi tall exceed 3cm
   'Zhangsan is 3cm taller than Lisi.'

Since the measure phrase would be optional without *chu*, the measure phrase requirement can be attributed to *chu* denoting 'exceed'. Semantically, the EXCEED function needs to be saturated. By analogy, *chu* behaves like English *than*, which can be saturated by either a standard of comparison or a measurement, as shown in (35).

(35)   Mary is taller than { John / 6 feet }.

On a side note, the behaviors of Mandarin *chu* and English *than* are not completely equal. First, *chu* may not be saturated by a standard of comparison, as in (34). Second, *chu* is optional even if the measure phrase is present, while *than* must be present if the standard of comparison is there in English. For instance, (36) is clearly unacceptable.

(36)   *Mary is taller than.

The intuition behind the unacceptability of (34) and (36) is the same. The morphemes *chu* and *than* are there to introduce either the difference or standard. A speaker would either omit *chu* or *than*, or use it with an allowed argument.

8.5.3   Interim summary for the lower DegP and AP

This section has focused on the lower DegP and shown that there are three variations to realize the lower Deg^0. The interaction of each of the variants with the higher DegP (i.e. *bi* and transitive comparatives) is also discussed (see table 8.2).

The lower DegP analysis further supports the boundedness hypothesis of this study. Based on the hypothesis, the obligatory use of measure phrase in transi-

tive comparatives can also be explained by the interaction between (i) the cross-categorial constraint on *ba* and transitive comparatives and (ii) the head movement constraint in the special case of closed scale adjectives. While the latter does in fact mark bounded predicates, it violates a syntactic constraint. Measure phrase, being the other option for denoting boundedness, must be present whenever the transitive comparative is used. In a broader sense, the Mandarin data show the interesting interactions between language-specific syntax, semantics and lexicon.

8.6 Summary

This discussion chapter has focused on the two alternation contructions in Mandarin in verbal and adjectival predicates. The experimental data confirmed the boundedness hypothesis. All four predictions regarding the alternations are borne out:

1. The *ba*-construction and transitive comparatives can be subsumed under a $Deg_{bounded}$ function, which requires its complements to be bounded.

2. The canonical SVO order and *bi*-comparatives are subsumed by the absence of $Deg_{bounded}$ function, which makes the sentence unselective regarding the boundedness of its complements.

3. The alternations in the verbal and adjectival domains can be explained under the same analysis, showing an interesting parallel between the two categories.

4. The acceptability pattern of the transitive comparative can be attributed to lexicalization of adjectives in Mandarin and does not forbid a unified analysis between verbal and adjectival predicates.

This chapter has also discussed other phenomena in Mandarin that are related to the two alternations. The next chapter will focus on the broader implications, such as a cross-categorial behaviors and the lexical categories.

9. IMPLICATIONS

In the discussion, I have shown how the boundedness hypothesis predicts the behaviors of the alternations in VP and AP in Mandarin. In this chapter, I discuss the significance of the cross-categorial approach for the syntax-semantics interface in a more general sense.

9.1 The syntax-semantics interface

9.1.1 Grounding syntactic features with semantics

The present study sets out to investigate the relation between syntax and semantics. The experimental results show that boundedness can predict the behaviors of the alternations in VP and comparatives. In a broader sense, the boundedness hypothesis here can be seen as an instance of how a semantic component constrains syntactic selection. More specifically, I argue for a position that boundedness is a case in which semantics is a source of syntactic feature.

Chomsky (1995) introduces the device of feature-checking, which is a mechanism to motivate syntactic operations via the interaction between interpretable and uninterpretable features. Many studies discuss the interaction between formal features like person, number and gender (commonly known as ϕ-features) and their effects on morphological agreement and syntactic movements. The present study applies a similar idea in syntactic selection, in the sense that syntactic operations (e.g. seletion or subcategorization, copy and movement) are motivated by semantics. As discussed in the previous chapter, Francis & Matthews

(2005) use several formal features to distinguish lexical categories as a separate dimension in addition to syntactic features. Guo (2012) also posits a formal [gradable] feature, which shares the same spirit that syntactic features might find correlates in semantics. This study follows the same line of thought and suggest that boundedness is another formal feature that links semantics and syntax.

The present study has shown that boundedness can explain the behaviors of Mandarin predicate alternations. A natural follow-up question is whether the same idea can be extended to other languages, or even all languages. In chapter 2, the concept of boundedness in relation to syntax has already been discussed (Thompson, 2006). However, due to the fact that English does not have a syntactic equivalent of the *ba*-construction, or a comparable VP alternation, it is difficult to find a direct comparison to test whether the boundedness constraints is present in English. On a speculative note, one may also consider that there are other strategies that show boundedness. For instance, both (1) and (2) are syntactically acceptable in English. Sentence (2) seems to be more bounded, based on its compatibility with *for*-PP temporal modification.

(1)   He looked at the person (for a while).

(2)   He took a look at the person (# for a while).

What the pair shows is that the same distinction in meaning may not manifest itself in exactly the same syntactic contrast (e.g. predicate alternation in Mandarin). The fact that there is no direct counterpart should not be considered a challenge to the theory presented in this study.

9.1.2 Cross-categorial behaviors

More importantly, the experimental results have confirmed that the semantic boundedness constraint is active in both verbal and adjectival domains. For each domain, there is one variant in the alternation that selects bounded predicates.

It is a well-known challenge that Mandarin adjectives often behave like verbs. It has therefore been argued that adjectives might not form its own category in Mandarin (McCawley, 1992), and this is not a unique problem for Mandarin (see Kim (2002) and Kim (2008) for Korean). Since the present study only tested alternations in VP and AP, the data would only be informative about the event and property domains. Therefore, the following discussion would limit to the distinction between verbs and adjectives, but not nouns.

Baker (2003) claims that syntactic categories N, V and A are universal, i.e. all languages are expected to have at least these three categories. The division is based on formal syntactic features, such as +N and +V. Adjectives are defined in Baker (2003) by the lack of licensing for specifiers (which is the defining feature for verbs) and the lack of reference (which is the defining feature for nouns). The Mandarin data provide a counterexample for universally distinct categories, in that the verbs and adjectives are subject to similar constraints. By Grano & Kennedy (2012)'s account, the comparative does in fact license the case of its specifier (i.e. the standard of comparision). This challenges the syntactic definition for categories. Since the adjective in Mandarin comparatives may assign case in the specifier of the adjective, Baker's account would either take Mandarin comparatives as verbal constructions and claim that morphemes that enter Mandarin comparatives are in fact verbs, or that the definition of licensing needs revision. The first option would be problematic, because all Mandarin gradable predicates seem to be able to occur in comparatives, one would be forced to say

that only non-gradable adjectives are adjectives in Mandarin. The second option would also be problematic for the fundamental distinction made between verbs and adjectives in Baker (2003). For example, Baker (2003)'s theory may claim that Mandarin adjectives are dominated by phonetically null Predicate Phrase that licenses the argument. However, empirical testability aside, this solution does not resolve the verb–adjective distinction. Since verbs in general are also dominated by functional categories such as little-v (which licenses the external argument), a Predicate Phrase would be parallel to a VoiceP or vP in verbal predicates.

On the other hand, there seems to be a difference between verbs and adjectives in their lexical semantic contents and the information packaging (Croft, 2012). While a naive semantic distinction for categories is clearly unsatisfactory (e.g. nouns denote things, people and places, etc.), the following will explore some other proposals.

McCawley (1992) claims that Mandarin adjectives should be classified as verbs. He proposes a few criteria (which he considers universals) to determine whether V and A should form separate categories. His universal (iv) states that '(d)egree and comparative expressions combine more directly with As than with Vs, both morphologically and with regard to word order'(McCawley, 1992, p.232). He further demonstrates this point by contrasting 'John is fonder of Mary than of Ann.' and 'John likes Mary very much.' Since *-er* directly attaches to *fond*, this would show that *fond* is an adjective, for McCawley. In Mandarin, there is no difference with regard to the behaviors in word order or morphology. For example, McCawley cites *bi*-comparatives as evidence for VP and AP being in the same environment and concludes that Mandarin adjectives are actually verbs. An apparent problem from the data in this study is that only *bi* allows VP and AP, but *ba* does not. By the selectional account of this study, one would have to include

additional conditions, such as a semantic one, to predict that *ba* selects only events and not scales, if V and A truly belonged to the same category[1].

Paul (2012) focuses on behavior of adjectives in relation to subordinator *de* and argues against the conflation of adjectives and verbs. By showing that some adnominal adjectives cannot occur predicatively, she proves that [Adjective-*de*-N] sequences do not come from relative clauses. Although this study has shown several similarities between VP and AP, it does not argue that verbs and adjectives should formally be treated as the same category. This study agrees with McCawley (1992) that intransitive stative verbs and adjectives are *similar*, for both are property-denoting predicates. However, based on the different distribution in some constructions (e.g. *ba* only takes verbs, transitive comparatives takes only adjectives), it is difficult to argue that Mandarin does not make a formal distinction between the two categories.

Francis & Matthews (2005) suggest that there are no universal syntactic categories, i.e. it is possible that not all languages make the same distinctions in categories. Following this claim, it is possible that some languages do not make a clear cut distinction between verbs and adjectives. Francis & Matthews point out that categories are not necessarily defined by the single dimension of syntactic properties. In addition to syntactic properties, they suggest that semantic features, such as [gradable], may contribute to definition for categories. This is directly supported by the *bi*-comparative allowing both VP and AP as its complement. Chapter 8 shows that VP and AP behave similarly, and that the similar behaviors can be explained under the same boundedness constraint, providing a way to understand what exactly is shared by the two distinct categories.

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[1]In addition, this universal would wrongly predict *like* to be an adjective in British English, as in (*Everyone quite likes Justin*), where a degree term *quite* directly modifies *like*. However, one may argue this is an idiosyncratic expression and does not reflect on the language for the most part.

From a semantic point of view, arguments and predicates are two fundamental types of building blocks of propositional meanings, which are often represented by sentences or utterances. Therefore, if we were to take semantic distinction and semantic definitions of universal categories seriously, the argument–predicate distinction should be taken into consideration. Under a generative formal framework of semantics (e.g. Heim & Kratzer (1998), but also most works on semantics cited in this study), both verbs and adjectives belong to predicates. The present study shows an example of how the similar behaviors across the two predicative categories, namely verbs and adjectives, can be captured.

9.2 On lexicalization

The present study advocates a theory that constrains how meaning components bundle together and how these components affect syntactic behaviors. In analytic languages, such as Chinese, morphemes are often stand-alone syllables and can combine freely with other morphemes. In more synthetic languages, such as German, Russian and Greek, words often manifest multiple semantic components and thus multiple nodes in the structure are represented by one single word. The distinction is not binary or categorical. Even within a language, one may see different levels of analyticity in different word class or constructions.

The discussion here is closely linked to the findings about the difference in word formation between verbs and adjectives in Mandarin. One of the differences between verbal and adjectival predicates in Mandarin is that multiple verbs can be used to form a single predicate. To recapitulate, Mandarin verbal predicates may be spelled out in multiple morphemes (e.g. *chi wan* 'eat finish'; *he guang* 'drink gone'), where the 'secondary predicate' often denotes the natural endpoint and makes the predicate telic. To some extent, these secondary predicates are

similar to complements in English phrasal verbs, which often come in the form of preposition or prepositional phrases. For instance, (4) entails a natural endpoint of the event but (3) does not.

(3)   John drank the coffee.

(4)   John drank up the coffee.

The difference between Mandarin verbal predicates and English phrasal verbs, such as (4), is that Mandarin VP may involve multiple morphemes (often multiple verbs too, e.g. *wan* 'finish' may be used as a lexical verb on its own, whereas English *up* does not typically appear as the main verb[2]). On the other hand, Mandarin adjectives do not appear to show the same pattern. Recall the discussion on the open and closed scale adjectives, in which the lack of movement shows the different internal structures between the two types of adjectives. In the discussion to follow, it will be shown that the difference relates to the interaction between lexicon and syntax. I will first introduce the nanosyntax approach to lexicalization, then discuss two ways the current study contributes to the theory.

9.2.1   Nanosyntax theory

Traditional generative grammar considers morphemes to be the smallest units in syntax. This approach takes morphemes as the basic units that interact in syntax. Building on the l-syntax in Hale & Keyser (1993), Starke proposes that

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[2]In fact, *up* can be used as a main verb in some cases.
(i) Tom { upped / raised } the ante on the game.
The English use of *up* displays a similar behavior as Mandarin. However, the use of *up* is more restricted than *raise*. This is similar with other prepositions that may double as verbs (e.g. *downed the glass of water*). Also, not all prepositions are capable of taking the verbal position (e.g. *about* and *along*). Therefore, English prepositions still behave differently from Mandarin secondary predicates.

sentence structures are more elaborate than what is often assumed. The idea that the basic building blocks in syntax are 'submorphemic' is central to the nanosyntax theory (Starke, 2009). That means syntactic heads do not always maintain one-to-one mapping with words or morphemes. Rather, a head may represent only a feature, and a morpheme may contain more than one feature. Put differently, a single morpheme can spell out more than one syntactic head. For a hierarchical structure in (5), many nodes may be realized in equal number or fewer morphemes. Each of the morphemes is a representation of a series of features/functions.

(5)
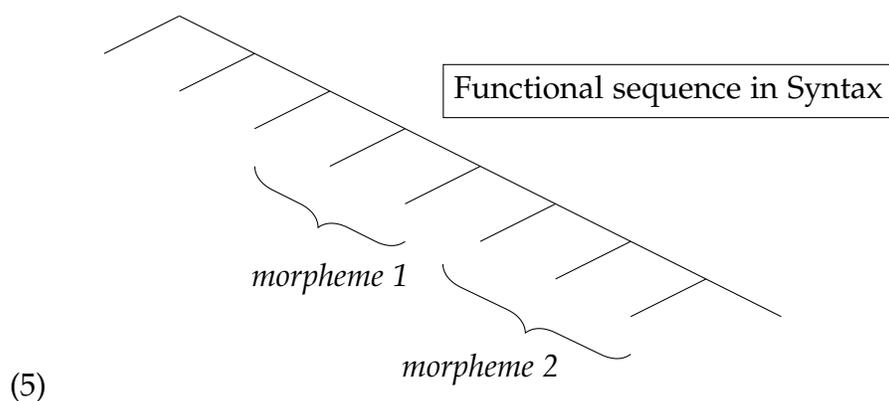
In order to prevent overgeneration, the process of spell-out, or lexicalization, is constrained by the adjacency of syntactic heads. It is postulated that only contiguous stretches of syntactic structure may be spelled out as a morpheme. For instance, in a hierarchy with A dominating B, and B dominating C, it is impossible for A and C to be spelled out as one morpheme and B as another one.

Mandarin and many Sinitic languages are often considered analytic, in the sense that a word often maps to a morpheme. For instance, *sha si* 'kill' in Mandarin typically comes in two separate morphemes, literally 'kill-die'. This allows the negators to intervene and gives the 'failure reading' in (6).

(6)   Zhangsan sha bu   si   zhizhu
       Zhangsan kill Neg die spider
       'Zhangsan couldn't kill the spider.'

       (Not: 'Zhangsan did not (try to) kill the spider.')

Compare (6) to English *kill*, which may be decomposed into multiple semantic features 'cause to become not alive'). Because English packages these features into one word, no negator is allowed to syntactically intervene like (6) in Mandarin. Instead, (7) in English is ambiguous between the counterfactual reading (Zhangsan did not initiate the event) or 'failure reading' similar to (6).

(7)   Zhangsan did not kill the spider.

The implication from this Chinese–English contrast is that when the lexical item packages more semantic components, it becomes more restricted in syntax[3]. In the following, it is argued that two contrasts demonstrate the case of how lexicalization reflects the syntactic structure, namely the ones between (i) open and closed scale structures and (ii) the split-vP hypothesis related to the *ba*-construction.

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[3]Note that it might or might not affect the semantics. For example. The 'failure reading' is still possible in English (7), which indicates that negation might take narrow scope.

9.2.2 Spelling out functional categories

Scalar structure of adjectives

As argued in chapter 8, open scale (e.g. *gao* 'tall', *kuan* 'wide') and closed-scale adjectives[4] (e.g. *man* 'full', *gan* 'dry') have different internal structures, based on their difference in compatibility with head movement.

Examples (8) and (9) illustrate how the feature-based nanosyntax may analyze the distinction. Each of the structures represents a lexical item. Because boundedness is analogous to endpoints and results in events (in the sense that no further points exist beyond the endpoint), I assume that the gradable feature is similar to the Process Phrase in events and dominates the phrase that expresses the boundedness feature, which corresponds to the Result Phrase in events (Ramchand, 2008). In the higher AP, the features are always gradable (see also the gradable feature proposed in Guo (2012)). The lower AP hosts the boundedness feature, which explains the systematic difference in syntax between open and closed scale adjectives.

(8)   Open scale, e.g. *gao* 'tall'

$$
\begin{array}{c}
\text{AP} \\
\diagup \quad \diagdown \\
\emptyset \qquad \text{A}' \\
\diagup \quad \diagdown \\
\text{A}^0 \qquad \text{AP} \\
| \qquad \diagup \ \diagdown \\
[\text{tallness}] \quad \emptyset \quad \text{A}' \\
| \\
\text{A}^0 \\
| \\
\emptyset
\end{array}
$$

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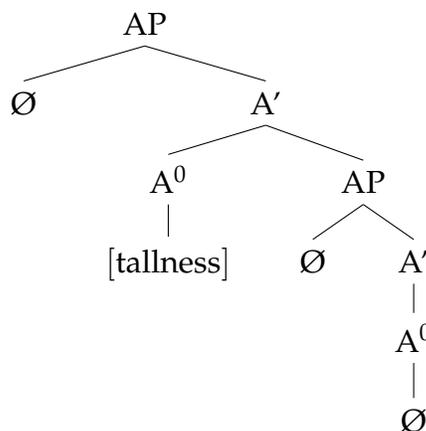
[4]The terms here follow the convention by Kennedy & McNally (2005) and are used interchangeably with the partial/total distinction in Rotstein & Winter (2004). This should be considered as a shorthand. Since the study did not make other distinctions in adjectives and scales, such as absolute vs. relative scales, the data do not have much to say about these other types of scales and properties.

(9)   Closed scale, e.g. *man* 'full'
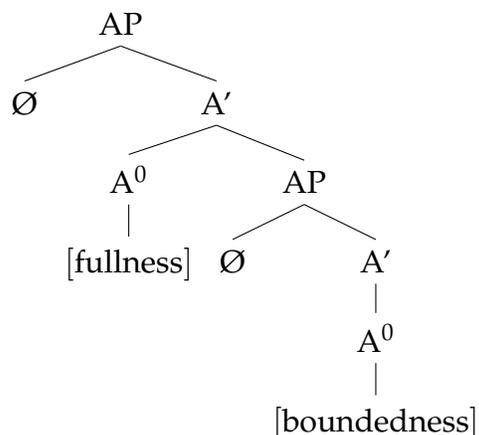
Note that the unacceptability of **wan-quan gao* 'fully tall' in Mandarin may indicate that there is no lower A^0, or that the lower A^0 carries a [-bounded] feature. Either way, the lexical item *gao* would be analyzed as the spell-out of a bare head, rather than a phrase with both higher A^0 and lower A^0. The lexical *man* 'full' would be analyzed as the lexicalization of two features [fullness] and [boundedness].

In addition to the head movement data discussed in the previous chapter, this analysis is also supported by negation data. Negation of open scale adjectives like (10) do not show ambiguity in terms of scalar interpretation. On the other hand, (11) is ambiguous: The cup in question may be filled, but not completely full. Alternatively, the cup may also be empty. Though the latter reading is pragmatically less plausible.

(10)   Zhangsan bu gao

        Zhangsan Neg tall

        'Zhangsan is not tall.'

(11)   beizi bu man

         cup Neg full

         'The cup is not full.'

Since the minimal difference between open and closed scales is the boundedness of the scale. The ambiguity in negation can be seen as the results from two scope readings. The wide scope of negation, i.e. over both [fullness] and [boundedness] features, would return the reading that the cup is not at all filled. The narrow scope would result in the reading that the cup is filled but not full.

The nanosyntax implementation is instructive to the explanation of the Mandarin data. The crucial difference between nanosyntax and mainstream generative grammar is that the former does not treat lexical words as the minimal units in syntax. As put by Starke (2009, p.6), '(nanosyntax) departs from the consensus that "syntax projects from the lexicon". Syntax projects from single features and nothing else... Syntax doesn't build on morphemes, it builds morphemes.' The tight mapping between semantics/features and syntax can systematically relate the syntactic operation, e.g. the constraint on movements, and the negation ambiguity with the semantics. If one were to take both *gao* 'tall' and *man* 'full' as heads in the syntactic structure, one would have to resort to lexical ambiguity for the differences, which may be difficult to generalize. In this regard, the Mandarin data support the nanosyntax approach.

Split vP

The boundedness hypothesis in this study relies on the notion that the verbal and adjectival domains behave similarly. One of the proposed similarities is the

two layers of functional categories above the respective lexical projections, i.e. the VP and AP.

In the literature review, we have seen that Huang et al. (2009) proposes a language-specific structure that separates *ba* and little-v into two projections. The selection account given in this study confirms the structure by Huang et al. (2009). Also, this split-vP hypothesis is independently motivated by other researchers. Legate (2014) proposes a Voice projection that dominates the little-v projection in syntax. The former expresses active and passive, introduces the θ-role of the external argument (Kratzer, 1996) and assigns the accusative case. The latter manifests causation of events. Taken together, we have a split-vP structure with the general 'VoiceP' labelling that is headed by *ba* in Mandarin.

(12)
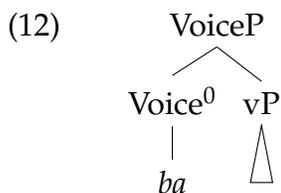
The behaviors of Legate (2014)'s VoiceP fit well with the *ba* data[5]. Recall that *ba* is different from regular causatives because it cannot be used iteratively, as discussed in example (29) in chapter 2.

(13)　　*Lisi ba　Zhangsan ba　pingguo chi le
　　　　　Lisi　BA Zhangsan BA apple　　eat Perf
　　　　　Intended: 'Lisi let Zhangsan ate the apple.'　=example (29) (chapters 2-4)

The VoiceP analysis, in which Voice[0] hosts the voice feature (i.e. active vs. passive), is also compatible with Mandarin passives with *bei*. Since *bei* shows ad-

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[5]As noted by Legate (2014), the functions of the generally accepted vP are split between *at least* two layers, the present analysis does not preclude the possiblity that the vP may also be split into more than two layers. As far as the present study is concerned, however, there is no obvious reason that indicates Mandarin splits its vP into more than two projections.

ditional complication, this study only points out here that *bei* is also treated as a functional head (contra the prepositional analysis of *bei* in Cheng (1995); Wei (1994)). The specific selectional criteria of *bei* and their relation to *ba* will require another study.

Section 9.2.2 has shown that the split-vP proposal is fully compatible with the nanosyntax or feature-based approach. The core idea is that syntactic projections correlate to semantic functions, but a projection does not always correspond to one single morpheme. Rather, it is possible that multiple projections are spelled out by one morpheme. The alternation data in this study have provided support for a split-DegP analysis of comparatives.

9.3 Summary

This chapter has discussed two theoretical implications from the findings in this study. Regarding lexicalization, the Mandarin data about adjective phrases and split-vP show support for the nanosyntax theory, which suggests feature-based syntactic analysis, as opposed to a morpheme-based syntax. Regarding category distinction, the contrasts between the alternations in Mandarin indicates the need for separate categories between verbs and adjectives. In addition, a semantically-motivated taxonomy of categories is suggested, which captures the formal distinction and the semantic similarities in Mandarin.

10. CONCLUSION

This study advocates a view that semantic constraints can affect syntax. Specifically, the study has shown that the boundedness of predicates is a predictive factor to the choice of sentence structure. In the experimental study that combines an acceptability judgment task and a comprehension task, two alternations in the verbal and adjectival predicates in Mandarin are investigated. In the *ba*-construction and transitive comparative construction, only bounded predicates are allowed. In the canonical SVO order and *bi*-comparative, there is no restriction with regard to boundedness.

Some scalar predicates bear a natural endpoint, such as verbal predicates that are telic or contain a perfective marker, or adjectival predicates that denote a closed or upper bound scalar structure or contain a measure phrase. This study hypothesizes that the VP and AP alternations in Mandarin are governed by the boundedness of these predicates. A variant in each of the verbal alternation and comparative alternation selects only bounded predicates. The selectional criteria are independently motivated in each of the verbal and adjectival domains. Boundedness is hypothesized to be the reason for the selective structures, such as the *ba*-construction and the transitive comparative.

The hypothesis is confirmed by the two tasks in the experimental study. By asking participants to choose a picture that best represents the given sentence, the comprehension task shows that participants are sensitive to the boundedness markers, which include measure phrases *yi-dian* in the adjectival domain, the secondary predicates and the perfective marker. The judgment task uses a 7-

point Likert scale to elicit participants' acceptability judgment to the sentences and shows that boundedness is predictive to whether the *ba*-construction and the transitive comparative are acceptable. The results confirmed the hypothesis that the two constructions do in fact select only bounded predicates, while the other two, SVO and *bi*-comparatives, are unselective to the boundedness. The major implication of the boudnedness hypothesis is a linguistic model that suggests semantics has direct impact on syntactic selection. This provides a principled account to how certain functional categories select their complements.

An interesting finding is that the transitive comparative shows an additional constraint on its predicate selection, namely, no closed scale adjectives are allowed in the transitive comparative construction. This additional restriction has led us to posit that adjectives in Mandarin are internally complex. An analogy is drawn between the decomposition of verbal predicates and the proposed decomposition of adjectival predicates. The incompatibility between transitive comparative and closed scale adjectives can be explained by the interaction of head movement requirement for the former and the phrasal nature of the latter. The theoretical implication of the finding is that verbs and adjectives show different patterns in lexicalization. Mandarin verbal predicates are more analytic, in the sense that a functional head and the associated features tend to lexicalize into a single lexical item. Adjectives, on the other hand, appear to be more synthetic, as evidenced by closed scale adjectives, which contain more semantic features than adjectives that do not denote bounded scales.

Building on the similar behaviors across the two categories, verb and adjectives, the present study also shows that boundedness is the underlying common thread between event-denoting and property-denoting predicates. In English, these two domains are categorically different. Mandarin, on the other hand, does

not consistently show morphological distinctions between the two categories. The present study provides a new way to look at the ongoing debate about category distinction in Mandarin. Acknowledging that verbs and adjectives do share a lot in their syntactic-semantic operation, this study argues that it is necessary to maintain 'V' and 'A' as separate syntactic categories, even for Mandarin. Because of the prominence of time-related grammatical markers like *le*, the V–A distinction is useful in understanding various phenomena, such as the incompatibility between *ba* and adjectival predicates. To account for the similarity between V and A, a model based on semantic functions is proposed. Conceptually, eventive verbs (verbs denoting non-stative eventualities) are argued to be scalar terms that are measured in time. This approach unifies verbs and adjectives as predicates (as opposed to arguments, which are often expressed by nouns).

REFERENCES

REFERENCES

Anderson, Stephen. 1971. On the role of deep structure in semantic interpretation. *Foundations of Language* 387–396.

Baker, Mark C. 2003. *Lexical categories: Verbs, nouns, and adjectives*, vol. 102. Cambridge University Press.

Barner, David & Alan Bale. 2002. No nouns, no verbs: psycholinguistic arguments in favor of lexical underspecification. *Lingua* 112(10). 771–791.

Beavers, John. 2010. The structure of lexical meaning: Why semantics really matters. *Language* 86(4). 821–864.

Beavers, John. 2011. On affectedness. *Natural Language & Linguistic Theory* 29(2). 335–370.

Bender, Emily. 2000. The Syntax of Mandarin ba: reconsidering the verbal analysis. *Journal of East Asian Linguistics* 9. 105–145.

Borer, Hagit. 2005a. *Structuring sense: In name only*, vol. II. Oxford University Press.

Borer, Hagit. 2005b. *Structuring sense: the normal course of events*, vol. II. Oxford University Press.

Borer, Hagit. 2013. *Structuring sense: Taking form*, vol. III. Oxford University Press.

Champollion, Lucas. 2010. *Parts of a whole: Distributivity as a bridge between aspect and measurement*: University of Pennsylvania dissertation.

Chao, Yuan Ren. 1968. *A Grammar of Spoken Chinese*. University of California Press, Berkeley, Los Angeles, London.

Cheng, Lisa Lai-Shen. 1995. On passive in Mandarin Chinese. *Toronto Working Papers in Linguistics, Linguistic Graduate Course Union* 8. 42–59.

Chomsky, Noam. 1970. Remarks on nominalization. In *Studies on semantics in generative grammar*, The Hague: Mouton.

Chomsky, Noam. 1995. *The minimalist program*. MIT Press.

Chung, Sandra. 2012. Are lexical categories universal? the view from Chamorro 38(1–2). 1–56. doi:10.1515/tl-2012-0001.

Constantinescu, Camelia. 2011. *Gradability in the nominal domain*: LOT, Netherlands Graduate School of Linguistics, Utrecht dissertation.

Corver, Norbert. 2009. Getting the (syntactic) measure of measure phrases. *The Linguistic Review* 26. 67–134.

Cresswell, M J. 1976. The semantics of degree. In Barbara Hall Partee (ed.), *Montague grammar*, 261–292. Academic Press.

Croft, William. 2012. *Verbs: Aspect and causal structure*. Oxford University Press.

Croft, William & Eva van Lier. 2012. Language universals without universal categories. *Theoretical Linguistics* 38(1-2). 57–72.

Di Sciullo, Anne-Marie & Edwin Williams. 1987. *On the definition of word*. Springer.

den Dikken, Marcel, Yang Gu & Jie Guo. 2010. Positively comparative. *Ms., CUNY and The Chinese University of Hong Kong* .

Dowty, David. 1979. Word meaning and Montague grammar. the semantics of verbs and times. In *Generative semantics and in Montague's ptq*, Dordrecht: Reidel.

Dowty, David. 1991. Thematic proto-roles and argument selection. *Language* 547–619.

Embick, David. 2012. Roots and features (an acategorial postscript) 38(1–2). 73–89. doi:10.1515/tl-2012-0003.

Embick, David & Rolf Noyer. 2007. Distributed morphology and the syntax/morphology interface. *The Oxford handbook of linguistic interfaces* 289–324.

Erlewine, Michael Yoshitaka. 2007. A new syntax-semantics for the Mandarin bi comparative. University of Chicago MA thesis.

Erlewine, Michael Yoshitaka. 2008. The Verbal Nature of Mandarin Comparative *bi*. In *The proceedings of the national conference on linguistics*, Taipei, Taiwan: Linguistic Society of Taiwan.

Erlewine, Michael Yoshitaka. 2013. Degree comparison without degree abstraction. Manuscript, MIT.

Ernst, Thomas. 2010. Adverbs and light verbs. In *Proceedings of the 22nd North American Conference on Chinese Linguistics (NACCL-22) and the 18th International Conference on Chinese Linguistics (IACL-18)*, 178–195. https://naccl.osu.edu/sites/naccl.osu.edu/files/NACCL-22_2_43_ernst.pdf.

Fábregas, Antonio. 2009. A syntactic account of affix rivalry in Spanish nominalizations. http://ling.auf.net/lingBuzz/000928.

Filip, Hana. 2001. Nominal and verbal semantic structure: analogies and interactions. *Language Sciences* 23. 453–501. http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.133.2858.

Francis, Elaine, Charles Lam, Carol Chun Zheng, John Hitz & Stephen Matthews. 2015. Resumptive pronouns, structural complexity, and the elusive distinction between grammar and performance: evidence from Cantonese. *Lingua* 162. 56–81.

Francis, Elaine J. & Stephen Matthews. 2005. A multi-dimensional approach to the category in cantonese. *Journal of Linguistics* 41(02). 269–305. http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=315679&fulltextType=RA&fileId=S0022226705003270.

Gökgöz, Kadir. 2013. *The nature of object marking in American Sign Language*: Purdue University dissertation.

Grano, Thomas. 2011. Mandarin *hen* and universal markedness in gradable adjectives. *Natural Language and Linguistic Theory* 30. 513–565.

Grano, Thomas & Christopher Kennedy. 2012. Mandarin transitive comparatives and the grammar of measurement. *Journal of East Asian Linguistics* 21. 219–266. doi:DOI10.1007/s10831-012-9090-Y.

Gu, Yang. 2008. *Shitai, shizhi lilun yu hanyu shijian canzhao* [studies of tense, aspect and Chinese time reference]. In Shen Yang & Shengli Feng (eds.), *Dangdai yuyanxue lilun he hanyu yanjiu [contemporary linguistic theories and related studies of Chinese]*, 97–119. Beijing: Commerce Press.

Guo, Jie. 2012. *Form and meaning: Chinese adjectives and comparative constructions*: Chinese University of Hong Kong dissertation.

Hale, Ken & Samuel Jay Keyser. 1993. On argument structure and the lexical expression of syntactic relations. *The view from Building 20* (53–109).

Harley, Heidi & Rolf Noyer. 1999. Distributed morphology. *Glot international* 4(4). 3–9.

Hashimoto-Yue, Anne. 1971. Mandarin syntactic structures. Unicorn 8: Chinese Linguistics Project and Seminar.

Hay, Jennifer, Christopher Kennedy & Beth Levin. 1999. Scalar structure underlies telicity in "degree achievements". In *Proceedings of SALT*, vol. 9, 127–144.

Heim, Irene. 2000. Degree operators and scope. In *Proceedings of SALT*, vol. 10, 40–64. http://elanguage.net/journals/salt/article/viewFile/21.712/3433.

Heim, Irene & Angelika Kratzer. 1998. *Semantics in generative grammar*, vol. 13. Wiley-Blackwell.

Hengeveld, Kees, Jan Rijkhoff & Anna Siewierska. 2004. Parts-of-speech systems and word order. *Journal of Linguistics* 40(03). 527–570.

Huang, Cheng-Teh James, Yen-Hui Audrey Li & Yafei Li. 2009. *The Syntax of Chinese*. Cambridge University Press.

Huang, Shi-Zhe. 2006. Property theory, adjectives, and modification in Chinese. *Journal of East Asian Linguistics* 15(4). 343–369.

Jackendoff, Ray. 1991. Parts and boundaries. *Cognition* 41(1). 9–45.

Kayne, Richard. 1994. *The antisymmetry of syntax*. MIT Press.

Kennedy, Chris. 2005. Parameters of comparison. Department of Linguistics, University of Chicago.

Kennedy, Christopher. 2007. Vagueness and grammar: The semantics of relative and absolute gradable adjectives. *Linguistics and philosophy* 30(1). 1–45.

Kennedy, Christopher & Louise McNally. 2005. Scale structure, degree modification, and the semantics of gradable predicates. *Language* 345–381.

Kim, Christina, Ming Xiang & Christopher Kennedy. 2014. Shiftability and goal-dependence in gradable adjectives. Poster presentation at LSA annual meeting, Minneapolis, MN.

Kim, Ilkyu. 2008. Semantic structures of polysemous psych-adjectives in korean: A conceptual semantics approach. In *Proceedings of the 22nd pacific asia conference on language, information and computation*, 428–437. The University of the Philippines Visayas Cebu College, Cebu City, Philippines: De La Salle University, Manila, Philippines. http://www.aclweb.org/anthology/Y08-1045.

Kim, Min-Joo. 2002. Does korean have adjectives. *MIT Working Papers in Linguistics* 43. 71–89.

Kratzer, Angelika. 1996. Severing the external argument from its verb. In *Phrase structure and the lexicon*, 109–137. Springer.

Krifka, Manfred. 1998. The origins of telicity. In Susan Rothstein (ed.), *Events and grammar*, 197–235. Dordrecht: Kluwer.

Krifka, Manfred. 2001. The mereological approach to aspectual composition. *Perspectives on Aspect, Uil-OTS, University of Utrecht* .

Lam, Charles. 2014. A unified analysis to surpass comparative and experiential aspect. In *Proceedings of the 28th Pacific Asia Conference on Language, Information, and Computation*, 368–377. http://aclweb.org/anthology/Y/Y14/Y14-1043.pdf.

Legate, Julie Anne. 2014. *Voice and v: Lessons from acehnese* Linguistic Inquiry Monographs. MIT Press.

Li, Charles N. & Sandra A. Thompson. 1981. *Mandarin Chinese a functional reference grammar*. University of California press.

Li, Yen-Hui Audrey. 2006. *Chinese ba*, vol. 1 chap. 12, 374–468. Oxford: Blackwell.

Liao, Wei-wen Roger. 2005. Event boundary and the syntax-semantics of BA in Chinese. Presentation at TEAL3. http://www.people.fas.harvard.edu/~ctjhuang/teal3/rliao.pdf.

Lin, Jingxia & Jeeyoung Peck. 2011. The syntax-semantics interface in multi-morpheme motion constructions in Chinese. *Studies in Language* 35(2). 337–379.

Lin, Jo-Wang. 2009. Chinese comparatives and their implicational parameters. *Natural Language Semantics* 17. 1–27.

Link, Godehard. 1983. The logical analysis of plurals and mass terms: A lattice-theoretical approach. *Formal semantics: The essential readings* 127–146.

Lipenkova, Janna. 2011. Reanalysis of obligatory modifiers as complements in the chinese ba-construction. In *Proceedings of the 18th international head-driven phrase structure grammar conference, stanford: Csli publications*, .

Liu, Chen-Sheng Luther. 2010a. The Chinese *geng* clausal comparative. *Lingua* 120(6). 1579–1606.

Liu, Chen-Sheng Luther. 2010b. The positive morpheme in Chinese and the adjectival structure. *Lingua* 120(4). 1010–1056.

Liu, Chen-Sheng Luther. 2011. The Chinese *bi* comparative. *Lingua* 121(12). 1767–1795.

Liu, Chen-Sheng Luther. 2014. Comparatives. In Li Yen-Hui Audrey Huang, Cheng-Teh James & Andrew Simpson (eds.), *The handbook of Chinese linguistics*, 342–366. John Wiley & Sons, Inc.

Liu, Feng-hsi. 1997. An aspectual analysis of *ba*. *Journal of East Asian Linguistics* 6(1). 51–99.

Liu, Chi-Ming Louis. 2010. Mandarin Chinese as an exceed-type language. In *Proceedings of the 22nd North American conference on Chinese linguistics (NACCL-22)*, .

Lohndal, Terje. 2013. *Phrase structure and argument structure: A case study of the syntax-semantics interface*. Oxford University Press.

Luuk, Erkki. 2009. The noun/verb and predicate/argument structures. *Lingua* .

Luuk, Erkki. 2010. Nouns, verbs and flexibles: implications for typologies of word classes. *Language Sciences* 32(3). 349–365.

Marantz, Alec. 1997. No escape from syntax: Don't try morphological analysis in the privacy of your own lexicon. *University of Pennsylvania working papers in linguistics* 4(2). 14.

McCawley, James D. 1992. Justifying part-of-speech assignments in Mandarin Chinese. *Journal of Chinese Linguistics* 20(2).

Mok, Sui-Sang. 1998. *Cantonese exceed comparatives*: University of California, San Diego dissertation.

Morzycki, Marcin. 2006. Atelicity and measure phrases: Licensing measure phrase modification across AP, PP, and VP, 279–287.

Parsons, Terence. 1990. *Events in the semantics of english*. MIT Press.

Paul, Waltraud. 2012. Adjectives in Mandarin Chinese: The rehabilitation of a much ostracized category. In P. Cabredo-Hofherr & O. Matushansky (eds.), *Adjectives. formal analyses in syntax and semantics*, 115–152. Amsterdam: Benjamins.

Peck, Jeeyoung, Jingxia Lin & Chaofen Sun. 2013. Aspectual classification of Mandarin Chinese verbs: A perspective of scale structure. *Language and Linguistics* .

Pesetsky, David Michael. 1995. *Zero syntax: experiencers and cascades*. MIT Press.

R Development Core Team. 2008. *R: A language and environment for statistical computing*. R Foundation for Statistical Computing Vienna, Austria. http://www.R-project.org. ISBN 3-900051-07-0.

Ramchand, Gillian. 2008. *Verb meaning and the lexicon: A first-phase syntax*. Cambridge University Press.

Rothstein, Susan. 2004. *Structuring Events: A Study in the Semantics of Lexical Aspect*. Blackwell Publishing.

Rotstein, Carmen & Yoad Winter. 2004. Total adjectives vs. partial adjectives: Scale structure and higher-order modifiers. *Natural Language Semantics* 12(3). 259–288.

Rullmann, Hotze. 1995. *Maximality in the semantics of wh-constructions*: University of Massachusetts, Amherst, MA dissertation.

Schwarzschild, Roger. 2005. Measure phrases as modifiers of adjectives. *Recherches Linguistiques de Vincennes* 35. 207–228.

Schwarzschild, Roger & Karina Wilkinson. 2002. Quantifiers in comparatives: A semantics of degree based on intervals. *Natural Language Semantics* 10. 1–41.

Selkirk, Elisabeth. 1982. *The syntax of words*. MIT press.

Smith, C.S. 1991. *The Parameter of Aspect*. Kluwer Academic Publishers.

Stabler, Edward & Edward Keenan. 2003. Structural similarity within and among languages. *Theoretical Computer Science* 293(2). 345–363.

Starke, Michal. 2009. Nanosyntax: A short primer to a new approach to language. *Nordlyd* 36.1, special issue on Nanosyntax. http://www.ub.uit.no/baser/nordlyd/.

Starke, Michal. 2010. Towards elegant parameters. http://ling.auf.net/lingBuzz/001183.

Stockall, Linnaea & E. Matthew Husband. 2014. Processing (the) events: lexical and structural ingredients of inner aspect. In Carson T. Schütze & Linnaea Stockall (eds.), *UCLA working papers in linguistics: Connectedness: Papers by and for Sarah VanWagenen*, vol. 18, 255–271.

Su, Cheng-Chieh. 2012. the syntax of *bi*-comparatives in Mandarin Chinese. *Taiwan Journal of Linguistics* 10(1). `http://tjl.nccu.edu.tw/main/uploads/10.1-1__.pdf`.

Sundaresan, Sandhya. 2013. In support of an articulated v layer: evidence from Tamil. Paper presented at the Little v Workshop in Leiden. `http://media.leidenuniv.nl/legacy/2-sundaresan-lilvhdt.pdf`.

Sybesma, Rint P.E. 1992. *Causatives and Accomplishments: the case of Chinese ba*. Holland: Leiden University dissertation.

Sybesma, Rint P.E. 1997. Why chinese verb-le is a resultative predicate. *Journal of East Asian Linguistics* 6(3). 215–261.

Sybesma, Rint P.E. 1999. *The Mandarin VP*. Kluwer Academic Publishers.

Tenny, Carol. 1987. *Grammaticalizing aspect and affectedness*: Massachusetts Institute of Technology, Cambridge dissertation.

Tenny, Carol. 1994. *Aspectual roles and the syntax-semantics interface*. Kluwer Academic Publishers.

Thompson, Ellen. 2006. The structure of bounded events. *Linguistic Inquiry* 37(2). 211–228.

Tian, Jun. 2006. The BA Construction in Mandarin Chinese: A Syntactic-semantic Analysis. `http://www.capi.uvic.ca/sites/capi.uvic.ca/files/Jun_BA_Construction.pdf`.

Tian, Jun. 2007. Categorical Status of the BA Construction in Mandarin Chinese. In *Proceedings of the 22nd NorthWest Linguistics Conference (NWLC22)*, .

Travis, Lisa. 2010. *Inner aspect: The articulation of vp*, vol. 80. Springer.

Travis, Lisa. 2013. Little v as domain/phase delimiter. Paper presented at the Little v Workshop in Leiden. `http://media.leidenuniv.nl/legacy/travis-handout.pdf`.

Varley, Nadia. 2013. Towards split voice-vp: Evidence from the Slavic languages. Paper presented at the Little v Workshop in Leiden. `http://media.leidenuniv.nl/legacy/little-v-abstract-varley.pdf`.

Vendler, Zeno. 1967. Linguistics in philosophy .

Verkuyl, Hendrik Jacob. 1972. *On the compositional nature of the aspects*, vol. 15. Springer.

Wei, Pei-Chuan. 1994. *Guhanyu beidongshi de fazhan yu yanbian jizhi* [on the development and mechanism of change of the passive construction in Classical Chinese]. *Chinese Languages and Linguistics* 2. 293–319.

Wellwood, Alexis. 2015. The semantics of comparison across categories. *Linguistics and Philosophy* 38. 67–101. doi:10.1007/s10988-015-9165-0.

Wellwood, Alexis, Valentine Hacquard & Roumyana Pancheva. 2012. Measuring and comparing individuals and events. *Journal of semantics* 29(2). 207–228.

Wilbur, Ronnie, Evie Malaia & Robin Shay. 2012. Degree modification and intensification in American Sign Language adjectives 92–101.

Winter, Yoad. 2006. Closure and telicity across categories. In *Proceedings of SALT*, vol. 16, 329–346.

Xiang, Ming. 2005. *Some topics in comparative constructions*: Michigan State University dissertation.

Xie, Zhiguo. 2011. *The relevance of gradability in natural language: Chinese and English*: Cornell University dissertation.

Xie, Zhiguo. 2014a. The degree use of the possessive verb yǒu in Mandarin Chinese: a unified analysis and its theoretical implications. *Journal of East Asian Linguistics* 23(2). 113–156.

Xie, Zhiguo. 2014b. The yú comparative construction in mandarin chinese. *Empirical Issues in Syntax and Semantics* 10.

Xiong, Zhongru. 2007. Analyses of the syntactic structure of comparative sentences in modern Chinese and its dialects. *Language and Linguistics* 8.

Yoon, Youngeun. 1996. Total and partial predicates and the weak and strong interpretations. *Natural language semantics* 4(3). 217–236.