Degree Expressions in Chinese

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Summary and keywords

Summary: Degree expressions in natural language reflect how human cognition performs abstract tasks like **taking measurements** (i.e., mapping items to degrees on a certain scale) and **conducting comparisons** between measurements. There is a great variation on how different languages encode notions like **degrees** and **scales** and operate comparison, inspiring ongoing theoretical development in degree semantics. This article presents major empirical data on degree expressions in Mandarin Chinese and surveys current research on Chinese-specific phenomena.

Compared to well-known English phenomena, Chinese gradable predicates like 高 *gāo* 'tall, high' seem rather syntactic-category-fluid, and due to the lack of comparative morphemes, their interpretation can be ambiguous between a comparative use and a positive/measurement interpretation. Typical degree expressions in Chinese, including the positive use, comparatives, equatives, and measurement constructions, demonstrate patterns different from those in English. Moreover, not only adjective-like words such as 高 *gāo* 'tall, high', but also property nouns (e.g., 魅力 *mèi-lì* 'charm', 钱 *qián* 'money') and mental verbs (e.g., 喜欢 *xǐ-huān 'like'*) have gradable meanings and can be used to form degree expressions.

With regard to these empirical phenomena, this article focuses on the following fundamental research questions in the literature: (a) **The encoding of comparison**: In a language lacking comparative morphemes, how is the distinction established between the positive and the comparative interpretation? (b) **Compositional derivation**: How are Chinese comparatives distinct from well-studied English clausal comparatives? (c) **Ontology of degrees**: How do various Chinese degree expressions reveal the underlying ontological assumptions of scales and degrees?

Even though many of the research questions are still hotly debated in the existing literature, research on Chinese empirical data already brings profound implications for theoretical development of degree semantics. In particular, this article suggests a new look at variations between languages with vs. without overt comparative morphemes (e.g., English *-er*) and invites more research on the pragmatics involved in cross-linguistic degree expressions.

Keywords: Measurement, Comparison, Degrees, Scales, Gradable predicates, Positive use of gradable predicates, Measurement constructions, Comparatives, Equatives, Degree questions

1 Introduction

Natural language supports the expression of **measurement** and **comparison**. Measurement essentially means mapping an entity/individual or event (e.g., Brienne, the arrival of a guest) to a value on a relevant scale (e.g., a scale of height, a timeline). Values on the same scale can further undergo comparison (e.g., comparing two heights). **Scalar values** are often represented as **degrees**, i.e., elements that constitute a totally ordered set called **scale** (e.g., 37°C represents a degree on a celsius scale of temperature). Therefore, measurement- and comparison-related expressions are called **degree expressions**. Within formal linguistics, **degree semantics** has been developed to study these linguistic phenomena (see Seuren 1973, Cresswell 1976, Hellan 1981, Hoeksema 1983, von Stechow 1984, Heim 1985 among many others; see Beck 2011 for a review).

Degree semantics has been largely developed based on English data. However, from a global perspective, many features of English degree expressions are shared only by European languages and those (e.g., Modern Hebrew) that have experienced strong contact with European languages. The great cross-linguistic variation on degree expressions raises new research questions. This article presents major empirical data on degree expressions in Mandarin Chinese, surveys current research on Chinese-specific phenomena, and addresses theoretical implications. This introduction starts with a brief presentation of degree semantics and then outlines the scope and roadmap of this article.

1.1 *A brief presentation of degree semantics*

Measurement and comparison involve abstracting individuals into a value along a **dimension** (or **scale**) such as height, velocity, temperature, or time. In natural language, **gradable adjectives** (e.g., *tall*, *fast*, *hot*, *early*) constitute a major way of encoding the meaning of gradable dimensions. Based on the use of gradable adjectives, typical degree expressions include the **positive use** (see (1a)), **measurement constructions** (see (1b)), **comparatives** (see (1c)), **equatives** (see (1d)), and **degree questions** (see (1e)).

(1) Typical degree expressions with the use of gradable adjectives:

a. Brienne is tall. — **Positive use** of gradable adjective *tall*
b. Brienne is 6 feet 3 inches tall. — **Measurement construction**
c. Brienne is (1 inch) taller than Jaime (is). — **Comparative**
d. Brienne is as tall as Jaime (is). — **Equative**
e. How tall is Brienne? — **Degree question**

In analyzing the meaning of gradable adjectives, **the delineation approach** (represented by Klein 1980; see also McConnell-Ginet 1973, Kamp 1975, Lewis 1979, and see Burnett 2017 for a recent development) is an influential competing theory to degree semantics. A short detour to this competing theory will shed light on what ontological assumptions for the notions of degrees and scales are needed.

Within **the delineation approach**, the meaning of gradable adjectives (e.g., *tall*) is

analyzed parallel to that of non-gradable ones (e.g., *red*): both denote **sets of individuals** (of type $\langle et \rangle$). For example, *tall* is considered a set with regard to a **comparison class** (i.e., similar, comparable items): depending on context, *tall* in (1a) can be interpreted as *tall for a woman* or *tall for a knight*. Suppose the comparison class is a set of knights, ordered along a dimension of height. Then a given context (say context c) corresponds to a **tripartite partitioning** of this **ordered set** of knights:

(2) a. the set '$\text{POS}_c(\text{TALL})$', the **positive extension** of *tall* in context c, includes those knights who are on the upper side of this ordering of knights;
b. the set '$\text{NEG}_c(\text{TALL})$', the **negative extension** of *tall* in context c, includes those knights who are on the lower side of this ordering of knights;
c. the set '$\text{GAP}_c(\text{TALL})$', the **extension gap** in context c, includes those knights who are between the upper and lower side of this ordering of knights.

Different contexts lead to different thresholds, cutting between $\text{POS}_c(\text{TALL})$ and $\text{GAP}_c(\text{TALL})$ and between $\text{GAP}_c(\text{TALL})$ and $\text{NEG}_c(\text{TALL})$, and yield different partitionings: a knight can be in $\text{POS}_{c_1}(\text{TALL})$ under context c_1, but $\text{NEG}_{c_2}(\text{TALL})$ under context c_2. However, all these context-dependent partitionings should be consistent with the original ordering of knights along the dimension of height: e.g., as far as Brienne is ranked higher than Jaime in this ordering, there can be no context c such that Brienne is in the set $\text{GAP}_c(\text{TALL})$ or $\text{NEG}_c(\text{TALL})$, but Jaime is in the set $\text{POS}_c(\text{TALL})$. Therefore, (1a) is true in a context c_0 if Brienne is in the set $\text{POS}_{c_0}(\text{TALL})$. The comparative sentence (1c) is true if there exists a context c such that Brienne is in the set $\text{POS}_c(\text{tall})$, while Jaime is not. The use of a measure phrase like *6 feet 3 inches* in (1b) can be considered a restriction on a set of individuals, yielding an **equivalence class** of all individuals with this height.

Within the delineation approach, a degree (e.g., $6'3''$) is not a conceptual primitive: it is considered a shorthand for an equivalence class of individuals having the same measurement. Therefore, measurement and comparison are considered performed along an **ordinal scale** (i.e., an **ordered set of equivalence classes**), which has **ordering**, but not necessarily other mathematical properties (see Stevens 1946).

However, a mere ordering of equivalence classes can only address inequalities, but cannot support the measurement of the difference between two equivalence classes (see Stevens 1946). Crucially, in natural language, the use of numerical differentials in comparatives (see *1 inch* in (1c)) relies on the notion of **measurable differences**, requiring the assumption of a scale with **both ordering and units**, i.e., an **interval scale**.

Different from the delineation approach, **degree semantics** assumes (sometimes implicitly) abstract, number-like degrees along an interval scale (see Kennedy 1999, Solt 2015, L. Zhang (张琳敏) and Ling (凌佳) 2021 for discussion on the notion of scales in natural language).

We use d to represent the type of degrees. The meaning of a gradable adjective involves a **measure function** which maps an individual to a degree along a relevant scale, as illustrated in (3). The implementation in (3a) simply considers a gradable adjective a measure function (see Kennedy 1999), while the implementation in (3b) also

includes an operation of comparison, '≥' (see Cresswell 1976, Hellan 1981, von Stechow 1984, Heim 1985). In (3b), [[tall]] relates a degree d and an individual x, meaning that the height measurement of the individual reaches the degree d (i.e., x is tall to degree d).

(3) a. $[\![\text{tall}]\!]_{\langle ed\rangle} \stackrel{\text{def}}{=} \lambda x.\textsc{height}(x)$ a measure function of type $\langle ed\rangle$
b. $[\![\text{tall}]\!]_{\langle d,et\rangle} \stackrel{\text{def}}{=} \lambda d.\lambda x.\textsc{height}(x) \geq d$ a relation between a degree and an entity

Based on (3b), the semantics of major English degree expressions can be analyzed in a unified way. The derivation of the **positive use** (see (4)) and a **measurement construction** (see (5)) is straightforward. The positive use assumes a context-dependent **free variable**, **pos**, representing the threshold of being tall for a certain comparison class (see Bartsch and Vennemann 1972, Cresswell 1976, von Stechow 1984, Kennedy 1999).

(4) [[Brienne is pos tall]] ⇔ $\textsc{height}(\text{Brienne}) \geq \textsc{pos}$ (1a)
(pos: a silent, context-dependent free variable serving as the degree argument of the gradable adjective and representing the threshold of being tall)

(5) [[Brienne is 6 feet 3 inches tall]] ⇔ $\textsc{height}(\text{Brienne}) \geq 6'3''$ (1b)

With a lambda abstraction over a degree variable, the **degree question** in (6) denotes the set of all degrees reached by Brienne's height, i.e., the set of all fragment answers to this degree question (see L. Zhang (张琳敏) and Ling (凌佳) 2021; see the categorial approach to questions represented by Hausser and Zaefferer 1978; see Krifka 2011 for a review).

(6) [[how tall is Brienne]] ⇔ $\lambda d.\textsc{height}(\text{Brienne}) \geq d$ (1e)
(This set is equivalent to $\{d \mid d \leq \textsc{height}(\text{Brienne})\}$)

For the derivation of **comparison constructions**, we focus on the syntactically much studied type: **clausal comparatives** shown in (7) and **equatives** shown in (8) (cf. **phrasal** comparatives and equatives, arguably qualitatively distinct from the clausal type). With the assumption of an elided gradable adjective in subordinate clauses (see Bresnan 1973, 1975, Chomsky 1977), the derivation in (7) and (8) involves **lambda abstraction over a degree variable** in both the matrix and the subordinate clause. Comparative morpheme *-er/more*, analyzed as a comparison operator, is like a quantificational determiner (e.g., *every*) and relates two sets of degrees. Eventually, the difference between comparatives and equatives amounts to whether the comparison yields a strict vs. non-strict inequality.

(7) [[Brienne is tall**er** than Jaime is ~~tall~~]] ⇔ $\textsc{height}(\text{Brienne}) > \textsc{height}(\text{Jaime})$ (1c)
(Consider this **subcomparative** sentence: *The bathtub is wider than the door is tall.*)
LF: [-er [λd.Jaime is d-tall]] [$\lambda d'$.Brienne is d'-tall]
a. **Matrix clause**: $[\lambda d'.\textsc{height}(\text{Brienne}) \geq d'] = \{d' \mid d' \leq \textsc{height}(\text{Brienne})\}$
Subordinate *than*-clause: $[\lambda d.\textsc{height}(\text{Jaime}) \geq d] = \{d \mid d \leq \textsc{height}(\text{Jaime})\}$
b. *-er* performs comparison: $[\![\text{-er}]\!]_{\langle\langle dt\rangle,\langle dt,t\rangle\rangle} \stackrel{\text{def}}{=} \lambda D_1.\lambda D_2.\textsc{max}(D_2) > \textsc{max}(D_1)$
($\textsc{max} \stackrel{\text{def}}{=} \lambda D.\iota d[d \in D \wedge \forall d'[d' \in D \rightarrow d' \leq d]]$)

(With a numerical differential d, $[\![\text{-er}]\!] \stackrel{\text{def}}{=} \lambda d.\lambda D_1.\lambda D_2.\textsc{max}(D_2) \geq \textsc{max}(D_1) + d$)
(An alternative implementation: $[\![\text{-er}]\!]_{\langle\langle dt\rangle,\langle dt,t\rangle\rangle} \stackrel{\text{def}}{=} \lambda D_1.\lambda D_2.\exists d[d \in D_2 \wedge d \notin D_1]$)

(8) $[\![\text{Brienne is } \textbf{as} \text{ tall as Jaime is } \sout{\text{tall}}]\!] \Leftrightarrow \textsc{height}(\text{Brienne}) \geq \textsc{height}(\text{Jaime})$ (1d)
$[\![\text{as}]\!]_{\langle\langle dt\rangle,\langle dt,t\rangle\rangle} \stackrel{\text{def}}{=} \lambda D_1.\lambda D_2.\textsc{max}(D_2) \geq \textsc{max}(D_1)$ ⇝ a non-strict inequality

1.2 *Scope and roadmap of the article*

The brief presentation of degree semantics in Section 1.1, though not entirely uncontested and ignoring many technical details, lays out basic ingredients of degree semantics for English phenomena:

(9) a. Ontologically, comparison (as encoded by English comparatives) assumes an **interval scale**, supporting the potential measurement of differences.
b. Comparison is formally analyzed as an **inequality relation between (sets of) degrees** (along an interval scale), not between (sets of) individuals.
c. Gradable adjectives contribute a **measure function** from entities to degrees.
d. The positive use assumes a silent context-dependent free degree variable, **pos**.
e. The derivation of English clausal comparatives (and equatives) involves **lambda abstraction over a degree variable**.
f. The semantic contribution of **English comparative morpheme *-er/more*** is considered to perform comparison (between degrees).

Some parts of these theoretical characterizations might be cross-linguistic principles that reflect human language or cognitive universals, while others might be parameters allowing for variations (see, e.g., the proposal by Beck et al. 2009 of three parameters and relevant discussion in Section 6). Yet it is also likely that investigations based on cross-linguistic phenomena eventually lead to a substantial update of the theory.

With regard to measurement- and comparison-related expressions, Chinese, a morphologically impoverished language often with a blurry boundary among syntactic categories, demonstrates interesting patterns distinct from their translational equivalents in English. Most notably,

(10) a. Gradable predicates in Chinese lack a comparative form and thus can be ambiguous between a positive/measurement use and a comparative use.
b. The positive use of gradable predicates (e.g., 高 *gāo* 'tall, high') often requires the presence of a semantically bleached adverbial modifier, 很 *hěn*.
c. Subcomparatives, which motivate the compositional analysis of English clausal comparatives (see (7)), do not exist in Chinese.
d. There are different types of equatives: some based on the use of possessive verb 有 *yǒu* 'have' and some based on the notion of sameness.
e. In addition to words like 高 *gāo* 'tall, high', property nouns that convey abstract concepts (e.g., 魅力 *mèi-lì* 'charm', 钱 *qián* 'money') and mental verbs (e.g., 喜欢 *xǐ-huān 'like'*) can also be used to form degree expressions.

The empirical observations summarized in (10) give rise to hotly debated research questions, inspiring reflection on how dimensions, degrees, and operators of comparison can possibly be encoded in natural language and what kind of division of labor is possible.

In particular, from a global perspective, the lack of predicate marking for the comparative reading (i.e., the lack of comparative morphemes like English *-er*) is cross-linguistically common. According to *The World Atlas of Language Structures Online* (*WALS*, Stassen 2013), 'in the vast majority of languages, such overt marking is absent; predicative adjectives in comparatives retain their unmarked, "positive", form.' In addition, *WALS* demonstrates a striking areal distribution of various types of comparatives. Thus Mandarin Chinese phenomena represent a type different from that of English and are worth a thorough study.

Section 2 presents a theory-neutral description of major Chinese data, illustrating the generalizations in (10). Based on these data, Sections 3–5 each address one of the following much discussed yet still largely unsettled research questions:

(11) a. **The encoding of comparison**: In a language lacking comparative morphemes, how is the distinction established between the positive and the comparative interpretation of gradable predicates (section 3)?
b. **Compositional derivation**: How are Chinese comparatives distinct from well-studied English clausal comparatives (section 4)?
c. **Ontology of degrees**: How do various Chinese degree expressions reveal on the underlying ontological assumptions of scales and degrees (section 5)?

Section 6 is a general discussion, addressing the implications of Chinese data on the development of degree semantics. Section 7 suggests further research needed. In particular, the discussion in this article suggests a new look at variations between languages with vs. without overt comparative morphemes (e.g., English *-er*) and invites more future research to consider a pragmatic approach to related phenomena.

This article does not aim to present a complete survey of all the degree-related phenomena in Chinese. Rather, it aims to show how cross-linguistic data from Chinese contribute new insights on formal linguistics. Therefore, many aspects of degree expressions are not included here. For example, superlatives, excessive expressions (e.g., with the use of 太 *tài* 'too, so much'), and the attributive use of gradable predicates will not be discussed. Some phenomena (e.g., degree modifier 更 *gèng*) will be only briefly mentioned in the discussion on the featured phenomena. Important theoretical issues like vagueness, subjectivity, and scale structures in interpreting gradable predicates, modality-related gradability, and scalar implicature will not be dealt with here. (Interested readers can refer to the *Further reading* section of this article for more information.)

2 Empirical observations on Chinese degree expressions

This section presents a bird's eye view on major degree expressions in Chinese. Section 2.1 shows the ambiguity in interpreting gradable predicates like 高 *gāo* ('tall' vs. 'taller'). The next three subsections address with more details the positive use (Section 2.2), comparatives (Section 2.3), and different types of equatives (e.g., those based on possessive verb 有 *yǒu* 'have' vs. those based on the notion of sameness) (Section 2.4). Sections 2.5 and 2.6 present degree expressions based on the use of property nouns and mental verbs, focusing on the patterns parallel with those based on gradable predicates.

2.1 *Gradable predicates and their ambiguous interpretations*

English gradable adjectives have a positive form and a comparative form. As illustrated in (12), the positive form, *long*, is used in the positive use (see (12a)) and the measurement use (see (12b)), while the comparative form, *longer* (which includes an inflectional morpheme, *-er*), is used in the comparative sentence (see (12c)). Cross-linguistically, many languages (e.g., Japanese, Korean, Swahili) lack a comparative morpheme that corresponds to English *-er*, and Chinese is among them.

(12) a. This movie was **long**. **Positive use**
b. That tennis match was 5 hours **long**. **Measurement construction**
c. That tennis match was **longer**. **Comparative**

In (13), under the given context, Chinese 高 *gāo* is interpreted as English *taller*, i.e., as the comparative form of a gradable predicate.

(13) Context: Between Yányàn and Míngmíng, I wonder who is taller.
a. 他们俩 谁 高?
tā-men-liǎ shéi gāo
3-PL-two who tall(-er)
***Wh*-question**: 'Between the two, who is taller?' ⇝ **Comparative**
b. 延燕 高 还是 明明 高?
yányàn gāo hái-shì míngmíng gāo
Yányàn tall(-er) or Míngmíng tall(-er)
Alternative Q.: 'Between Yányàn and Míngmíng, who is taller?' ⇝ **Comparative**
c. 延燕 高 (但 其实 这 两 人 都 有点 矮)
yányàn gāo (dàn qí-shí zhè liǎng rén dōu yǒu-diǎn ǎi)
Yányàn tall(-er) (but actually this two human both/all a-bit short)
To answer the questions (13a) and (13b): 'Yányàn is taller (but actually both people are a bit short).' ⇝ **Comparative**

There are two pieces of evidence to confirm that in (13c), 高 *gāo* has a comparative

reading, not a positive reading. First, (13c) can have a felicitous and non-contradictory continuation which provides further information that both people are a bit short. This continuation clearly rules out the positive reading of 高 *gāo* here. Second, (13c) is still true and felicitous even under a 'crisp judgment' context in which Yányàn is only slightly taller than Míngmíng. Sentence (13c) cannot mean an **implicit comparison** (i.e., (*compared to Míngmíng*), *Yányàn is tall*, which is true only if the difference between their heights is significantly large), but an **explicit comparison** (i.e., (*compared to Míngmíng*), *Yányàn is taller*). Thus again the positive interpretation of gradable predicate 高 *gāo* is ruled out (see also Kennedy 2007 on implicit vs. explicit comparison as well as crisp judgment).

Then in (14), Chinese 高 *gāo* is interpreted as English *tall*, i.e., as the positive form of a gradable predicate. This positive reading can also be confirmed by the fact that adding a continuation that means 'actually she is a bit short' is contradictory (see (14b)).

(14) a. 延燕 高 不 高?
yányàn gāo bù gāo
Yányàn tall(-er) NEG tall(-er)
A-not-A alternative question: 'Is Yányàn tall?' ⇝ **Positive**

b. 延燕 高 #(但 其实 她 有点 矮)
yányàn gāo #(dàn qí-shí tā yǒu-diǎn ǎi)
Yányàn tall(-er) #(but actually she a-bit short)
To answer the question (14a): 'Yányàn is tall #(but actually she is a bit short).' ⇝ **Positive**

The sentence (13c)/(14b) sounds a bit unnatural when uttered out of blue (see also Section 2.2). However, under their specific context, (13c) (with a stress on *Yányàn*) and (14b) (with a stress on *gāo*) are both natural but with different interpretations: a comparative interpretation for (13c) and a positive interpretation for (14b).

There are similar observations for sentences containing a measure phrase (e.g., *1 meter*). Based on our real-world knowledge about Huaihe River, in (15), 高 *gāo* is most naturally interpreted as English *higher*, and the entire sentence (15) has a comparative reading. However, in (16), 高 *gāo* is most naturally interpreted as English *high*, and the entire sentence (16) is considered a measurement construction.

(15) (和 过去 相比) 淮河 水位 高 (了) 一米
(hé guò-qù xiāng-bǐ) huái-hé shuǐ-wéi gāo (le) yī-mǐ
(with past compare) Huaihe-River water-level high(-er)(PRF) 1-meter
'(Compared with the past,) the water level of Huaihe River is 1 meter higher.' ⇝ **Comparative**

(16) 今年 淮河 水位 高 26 米
jīn-nián huái-hé shuǐ-wéi gāo 26-mǐ
this-year Huaihe-River water-level high(-er) 26-meter
'This year, the water level of Huaihe River is 26 meters high.' ⇝ **Measurement**

A perfective marker 了 *le* can be optionally added after 高 *gāo* in the comparative-reading sentence (15), but not in the measurement construction (16) or sentences in (13) or (14). This optional presence of an aspectual marker suggests that in (15), 高 *gāo* (here 'higher') behaves syntactically like a verb and semantically indicates a change (or increase) of 1 meter along a scale of height.[1] In this sense, the comparative sentence (15), which includes a numerical differential, is reminiscent of a bounded event.

In brief, these examples (i.e., (13c) vs. (14b), (15) vs. (16)) show that Chinese gradable predicates lack a comparative form, and their interpretation can be ambiguous between a positive/measurement use and a comparative use. A few factors, such as **question-under-discussion** (QUD), **world knowledge**, **the overt presence of comparison standard** (e.g., last year's (water level) in (15)), and **the use of aspectual markers** (e.g., an optional perfective marker 了 *le* for (15)), can help disambiguate.

2.2 *The positive use and the almost obligatory presence of 很 hěn*

Though the use of a gradable predicate alone can have a positive interpretation under some context (see (14)), the default way of constructing the positive use is to include a semantically bleached degree modifier, 很 ***hěn***.

Example (17) illustrates the most natural way to translate *Yányàn is tall* (or *Yányàn is clever*). This presence of 很 *hěn* is regardless of whether the following gradable predicate is monosyllabic (e.g., 高 *gāo* 'tall') or bisyllabic (e.g., 聪明 *cōngmíng* 'clever'). Thus, the use of 很高 *hěn gāo* as a default way of constructing the positive use here is not due to the general preference for bisyllabic words in modern Chinese.

(17) 延燕 很 { 高 / 聪明 }
yányàn hěn { gāo / cōngmíng }
Yányàn very { tall(-er) / clever(-er) }
'Yányàn is tall / clever.' ⇝ **Positive**

This presence of 很 *hěn* in the positive use is **almost** obligatory, but still allows some room for relaxation. On the one hand, as just addressed, the *hěn*-less examples in (14) have a positive interpretation under their specific context.

On the other hand, 很 *hěn* in (17) can be replaced by other degree modifiers, as illustrated in (18). The meaning of 很 *hěn* is rather bleached in (17), while other degree modifiers (see (18)) contribute to address to what extent Yányàn's height exceeds the context-dependent threshold of being tall.

(18) 延燕 { 非常 / 极其 / 相当 } 高
yányàn { fēi-cháng / jí-qí / xiāng-dāng } gāo
Yányàn { extraordinarily / extremely / quite } tall(-er)
'Yányàn is very / extremely / quite tall.' ⇝ **Positive**

[1] According to some native speakers, this perfective marker 了 *le* is preferably included in (15).

It is worth noting that there are two ways to negate the positive-reading sentence (17): (i) by replacing degree modifier 很 *hěn* with negation word 不 *bù* (see (19a)), and (ii) by directly inserting negation word 不 *bù* before 很 *hěn* (see (19b)). These two sentences have different interpretations. Example (19a) means the negation of *Yányàn is tall*, while (19b) means the negation of *Yányàn is very tall* (i.e., true under a scenario where Yányàn is a bit tall, but not to a great extent). These two negative sentences in (19) show that (i) unlike the default positive use in (17), the negation of the positive use does not require the presence of a semantically bleached 很 *hěn*, and (ii) when 很 *hěn* is indeed present in the negative sentence (19b), its semantics as a degree modifier is not bleached.

(19) a. 延燕 不 高
yányàn bù gāo
Yányàn not tall(-er)
'Yányàn is not tall.' ⇝ Not reaching the threshold of being tall

b. 延燕 不 很 高
yányàn bù hěn gāo
Yányàn not very tall(-er)
'Yányàn is not very tall.' ⇝ Not reaching the threshold of being very tall

2.3 *Bǐ-comparatives and transitive comparatives*

Comparatives typically express comparisons that result in the existence of a difference between items under comparison (cf. **equatives**, which typically express comparisons that result in no difference). In addition to the comparative reading of gradable predicates shown in Section 2.1 (see (13) and (15)), Chinese has two main types of comparatives, both with an explicitly expressed **comparison standard**: (i) in a ***bǐ*-comparative**, the comparison standard is introduced by 比 *bǐ*, and (ii) in a **transitive comparative**, the comparison standard directly serves as the sentence's object.

As illustrated in (20), a ***bǐ*-comparative** includes a *bǐ*-expression before the gradable predicate, overtly indicating the comparison standard (cf. (13) and (15)). Similar to English comparatives (see (1c)), Chinese *bǐ*-comparatives can optionally contain a numerical differential (e.g., *1 inch* in (20)). In (20), when this numerical differential is present, a perfective marker 了 *le* can be optionally inserted after the degree predicate 高 *gāo* here (see also (15)).

(20) 延燕 比明明 高(了) (一寸)
yányàn bǐ míngmíng gāo (le) (yī cùn)
Yányàn BI Míngmíng tall(-er)(-PRF) (1 inch)
'Yányàn is (1 inch) taller than Míngmíng (is).'

Adverbial degree modifier 更 ***gèng*** can be inserted before gradable predicate 高 *gāo* in a comparative, bringing a presuppostional requirement. (21), which means *Yányàn is taller even than Míngmíng*, presupposes that the comparison standard exceeds the

context-dependent threshold of being tall, i.e., Míngmíng is already tall. The use of 更 *gèng* makes the comparative sentence (21) incompatible with a numerical differential.[2]

(21) 延燕 比明明 更 高 (* 一寸)
yányàn bǐ míngmíng gèng gāo (*yī cùn)
Yányàn BI Míngmíng GENG tall(-er) (*1 inch)
Assertion: 'Yányàn is taller than Míngmíng (is).'
Presupposition brought by the use of 更 *gèng*: 'Míngmíng is tall.' 更 *gèng* ≈ *even*

In **transitive comparatives**, the comparison standard follows the gradable predicate. In (22), either 高 *gāo* directly works like a verb, taking a comparison standard as its object (see (22a)), or the gradable predicate 高 *gāo* first combines with one of these morphemes: 出 *chū* 'exceed' (see (22b)), 过 *guò* 'exceed' (see (22c)), and 于 *yú* 'at' (see (22d)):

(22) 'Yányàn is (1 inch) taller than Míngmíng .'

a. 延燕 高 明明 *(一寸)
yányàn gāo míngmíng *(yī cùn)
Yányàn tall(-er) Míngmíng *(1 inch)

b. 延燕 高出 明明 *(一寸)
yányàn gāo-chū míngmíng *(yī cùn)
Yányàn exceed in height Míngmíng *(1 inch)

c. 延燕 高过 明明 (一寸)
yányàn gāo-guò míngmíng (yī cùn)
Yányàn exceed in height *(Míngmíng) (1 inch)

d. 延燕 高于 明明 (* 一寸)
yányàn gāo-yú míngmíng (*yī cùn)
Yányàn exceed in height Míngmíng (*1 inch)

Compared with *bǐ*-comparatives and the comparative reading of bare gradable predicates (see Section 2.1), transitive comparatives shown in (22) are used in a more limited way (see Chao (赵元任) 1968, Xiang (向明) 2005, Liu (刘辰生) 2007, Erlewine 2007, Grano and Kennedy 2012, Xie (解志国) 2014b for more discussion on the data).

On the one hand, only a small set of gradable predicates, typically high-frequency,

[2]The insertion of 更 *gèng* does not require the overt presence of comparison standard. Thus, 更 *gèng* can also be inserted in the sentences in (13) and bring the presupposition that the comparison standard is already tall. However, due to its incompatibility with a numerical differential, 更 *gèng* cannot be inserted in (15), which contains 一米 *yī-mǐ* '1 meter' as a numerical differential. There is a further complication. As shown in (i), the expressions 一点 *yī-diǎn* 'a bit' and 不少 *bù-shǎo* 'much' (cf. numerical differentials) can be used along with 更 *gèng*, but semantically similar expressions like 很多 *hěn duō* 'much, a lot' are incompatible.

(i) 延燕 (比明明) 更 高 { (一点) / (不少) / (* 很 多) }
yányàn (bǐ míngmíng) gèng gāo { (yī-diǎn) / (bù-shǎo) / (*hěn duō) }
Yányàn (BI Míngmíng) GENG tall(-er) { (a-bit) / (much (= not little)) / (*very much(-er)) }
'Yányàn is still { (a bit) / (much) / (*much) } taller (than Míngmíng).'

monosyllabic ones, can be used in these transitive comparative constructions. The *chū*-comparatives (see (22b)) and *guò*-comparatives (see (22c)) even further require positive ones (e.g., 高 *gāo* 'tall, high', 长 *cháng* 'long', 多 *duō* 'many, much') and are incompatible with negative ones (e.g., 矮 *ǎi* 'short', 短 *duǎn* 'short', 少 *shǎo* 'few, little').

On the other hand, some of these transitive comparatives have special requirement with regard to the presence of numerical differentials: bare transitive comparatives (see (22a)) and *chū*-comparatives (see (22b)) require the obligatory presence of a numerical differential, while *yú*-comparatives (see (22d)) require the obligatory absence of a numerical differential. Numerical differentials are optional for *guò*-comparatives (see (22c)).

2.4 *Two types of equatives (and related degree constructions)*

English equatives like (1d) (repeated here as (23); see also the analysis in (8)) have a **non-evaluative** and **asymmetric** interpretation. The interpretation of (23) is non-evaluative, because it does not entail that the comparison standard reaches the context-dependent threshold of being tall (see Rett 2015 on the issue of evaluativity). It is asymmetric, because the comparee reaches the degree of the comparison standard, but not necessarily vice versa. In this sense, English equatives like (23) are similar to comparatives in conveying inequalities: while inequalities encoded by comparatives are strict, inequalities encoded by equatives are non-strict (see (7) and (8)).

(23) Brienne is as tall as Jaime (is). (1d)/(8): HEIGHT(Brienne) ≥ HEIGHT(Jaime)
Non-evaluative: (23) ⊭ Jaime is tall. (cf. evaluativity of negative antonym *short*)
Asymmetric: (23) ⊭ Jaime is as tall as Brienne is.

To convey the same meaning as English equative (23), Chinese adopts a **possessive-verb-based equative construction**, as shown in (24a). Possessive verb 有 *yǒu* 'have' has the meaning of existence or possession. Literally, (24a) means that Yányàn **has** the height of Míngmíng. **Measurement constructions** and **degree questions** in Chinese can also be constructed based on possessive verb 有 *yǒu*, as illustrated by (24b) and (24c) (see Xie (解志国) 2014a for more details on *yǒu*-based degree constructions).

(24) Degree expressions based on possessive verb 有 *yǒu* 'have':

a. 延燕 有 明明 (那么) 高
yányàn yǒu míngmíng (nà-me) gāo
Yányàn have Míngmíng (that-kind) tall(-er)
Equative: 'Yányàn is as tall as Míngmíng is.'
⇝ **Non-evaluative and asymmetric**
(那么 *nà-me* can be replaced by 那样 *nà-yàng*, also meaning 'that kind'.)

b. 延燕 有 6 尺 3 寸 高
yányàn yǒu 6 chǐ 3 cùn gāo
Yányàn have 6 foot 3 inch tall(-er)

Measurement construction: 'Yányàn is 6 feet 3 inches tall.'

c. 延燕 有 多 高?
yányàn yǒu duō gāo(er)
Yányàn have many/much/more tall(-er)
Degree question: 'How tall is Yányàn?'

Sameness-based equatives represent another type of equatives in Chinese. There are two subtypes: (i) ***gēn*-equatives**, which involve the use of 跟 *gēn* 'with' (or 和 *hé* 'and, with') and 一样 *yī-yàng* 'same' (see (25)), and (ii) ***xiàng*-equatives**, which involve the use of 像 *xiàng* 'similar' and 一样 *yī-yàng* 'same' (see (26)).

(25) a. 延燕 { 跟 / 和 } 明明 一样 高
yányàn { gēn / hé } míngmíng yī-yàng gāo
Yányàn { with / and } Míngmíng same tall(-er)
'Yányàn is as tall as Míngmíng (is).'
⇝ **Non-evaluative but symmetric** (cf. (24a))

b. % 延燕 { 跟 / 和 } 山 一样 高
% yányàn { gēn / hé } shān yī-yàng gāo
Yányàn { with / and } mountain same tall(-er)
'Yányàn is as tall as a mountain (is).'
For speakers who cannot get the metaphorical reading: (25b) sounds weird;
For speakers who can get the metaphorical reading: (25b) = (26b)

(26) a. 延燕 像 明明 一样 高
yányàn xiàng míngmíng yī-yàng gāo
Yányàn similar Míngmíng same tall(-er)
'Yányàn is similar to Míngmíng in being tall.'
Evaluative: ⇝ Both Yányàn and Míngmíng are tall.

b. 延燕 像 山 一样 高
yányàn xiàng shān yī-yàng gāo
Yányàn similar mountain same tall(-er)
'Yányàn is as tall as a mountain (is).' ⇝ metaphorical interpretation

Gēn-equatives like (25a) are also non-evaluative, but they differ from English equatives (see (23)) and Chinese possessive-verb-based equatives (see (24a)) in two aspects. First, many native speakers interpret *gēn*-equatives in a symmetric way: i.e., (25a) means that both people have the same height and thus entails that Míngmíng is as tall as Yányàn is.[3] Second, as shown in (27), measure phrases like '6 feet 3 inches' cannot

[3]However, according to some native speakers, the interpretation of (25a) seems also asymmetric. As illustrated in (i), it is likely that these native speakers interpret (25a) with a hidden 至少 *zhǐ-shǎo* 'at least'. It is also likely that the literal meaning of a *gēn*-equative is an 'at-least' reading, i.e., the same as a *have*-based equative in (24a), but it is Gricean pragmatics (just like in the interpretation of bare numerals, e.g., *he read three books* implies that he read exactly three books) and the competition between different equatives (e.g., possessive-verb-based (24a) vs. sameness-based (25a)) that lead to a preferred 'exactly' reading for (25a),

be used in *gēn*-equatives or *xiàng*-equatives (cf. (24b)).

(27) * 延燕 { 跟 / 和 / 像} 6 尺 3 寸 一样 高
* yányàn { gēn / hé / xiàng} 6 chǐ 3 cùn yī-yàng gāo
Yányàn { with / and / similar} 6 foot 3 inch same tall(-er)
Intended: 'Yányàn is as tall as 6 feet 3 inches.'

Xiàng-equatives in (26) are different from *gēn*-equatives in (25) in two ways. First, while *gēn*-equative (25a) is non-evaluative, *xiàng*-equative (26a) is rather evaluative. Example (26a) has a presuppositional requirement (i.e., entails) that Míngmíng is tall. Second, while *xiàng*-equative (26b) has a felicitous metaphorical reading, this kind of metaphorical meaning seems less robust for *gēn*-equatives. Thus, for native speakers who cannot get the metaphorical reading, (25b) simply sounds weird according to our world knowledge.

Finally, it is worth mentioning that in Chinese, in addition to possessive-verb-based degree constructions (see (24)), measurement constructions and degree questions can be directly based on the use of measure phrases along with gradable predicates, as illustrated in (28). These sentences often demonstrate ambiguity between a measurement and a comparative reading (see also Section 2.1). Obviously, factors like world knowledge and an optional presence of perfective marker 了 *le* can help disambiguate.

(28) a. 延燕 高 6 尺 3 寸
yányàn gāo 6 chǐ 3 cùn
Yányàn tall(-er) 6 foot 3 inch
✓ **Measurement**: 'Yányàn is 6 feet 3 inches tall.'
? **Comparative**: 'Yányàn is 6 feet 3 inches taller.'
(The comparative reading is ruled out by our world knowledge.)
b. 延燕 高 多少?
yányàn gāo duō-shǎo
Yányàn tall(-er) many/much/more-few/little/less
% **Measurement**: 'how tall is Yányàn?' (available for some speakers);
✓ **Comparative**: 'by how much is Yányàn taller?' (preferably with 了 *le*)

2.5 *Degree expressions based on property nouns*

In Chinese, property nouns that convey abstract concepts, e.g., 魅力 *mèi-lì* 'charm', 钱 *qián* 'money', 理智 *lǐ-zhì* 'sense', constitute another common way of encoding the

which is symmetric. A more detailed investigation on this issue is left for future research.

(i) 延燕 (至少) { 跟 / 和 } 明明 一样 高
yányàn (zhì-shǎo) { gēn / hé } míngmíng yī-yàng gāo
Yányàn (at-least) { with / and } Míngmíng same tall(-er)
'Yányàn is (at least) as tall as Míngmíng (is).' **Asymmetric** (= (24a))

meaning of gradable dimension/scale and forming degree expressions (see also Francez and Koontz-Garboden 2017 for relevant cross-linguistic observations).

These property nouns combine with possessive verb 有 *yǒu* 'have' to form a gradable-adjective-like phrase (e.g., 有魅力 *yǒu-mèi-lì* 'charming', 有钱 *yǒu-qián* 'rich', 有理智 *yǒu-lǐ-zhì* 'sensible') to be used in the positive reading, comparatives, equatives, and degree questions (see Li (李晓) 2019, Y. Zhang (张伊文) 2020, N.N. Zhang (张宁) 2021).[4]

(29) a. 明明 有钱 还是 延燕 有钱?
míngmíng yǒu-qián hái-shì yányàn yǒu-qián
Míngmíng rich(er) or Yányàn rich(er)
Alternative Q.: 'Between Míngmíng and Yányàn, who is richer?'
⇝ **Comparative**

b. 明明 有钱
míngmíng yǒu-qián
Míngmíng rich(er)
To answer question (29a): 'Míngmíng is richer.'
⇝ **Comparative** (see also (13c))
(True even under a context where Míngmíng is just slightly richer than Yányàn ⇝ an explicit comparison (see Kennedy 2007))

(30) a. 明明 有 没 有钱?
míngmíng yǒu méi yǒu-qián
Míngmíng have NEG rich(er)
A-not-A question: 'Is Míngmíng rich?' ⇝ **Positive**

b. 明明 有钱
míngmíng yǒu-qián
Míngmíng rich(er)
To answer question (30a): 'Míngmíng is rich.' ⇝ **Positive** (see also (14b))

(31) 明明 {(很) / 非常 / 极其 / 相当} 有钱
míngmíng {(hěn) / fēi-cháng / jí-qí / xiāng-dāng} yǒu-qián
Míngmíng {(very) / extraodinarily / extremely / quite} rich(er)
Positive: 'Míngmíng is {- / very/extremely/quite} rich.' (see also (17) and (18))

(32) 明明 比延燕 (更) 有钱
míngmíng bǐ yányàn (gèng) yǒu-qián
Míngmíng BI Yányàn (GENG) rich(er)
***bǐ*-comparative**: 'Míngmíng is richer than Yányàn (is).' (see also (20))

[4] 有钱 *yǒu-qián* is ambiguous between the meaning of 'rich' (i.e., 钱 *qián* means an abstract property – wealth) and 'have money' (i.e., 钱 *qián* means some real entity). The latter reading cannot be used to form degree expressions (e.g., the positive use in (31), comparatives in (29) and (32), etc.). With the latter reading, 'have money', A-not-A question (30a) means 'Does Míngmíng have money?' We don't consider this reading here.

(33) 明明 有 他的 父亲 那么 有钱
míngmíng yǒu tā-de fù-qīn nà-me yǒu-qián
Míngmíng have his father that-kind rich(er)
Equative: 'Míngmíng is as rich as his father (is).' ⇝ **Asymmetric and evaluative**

(34) 明明 有 多 有钱?
míngmíng yǒu duō yǒu-qián
Míngmíng have many/much/more rich(er)
Degree question: 'How rich is Míngmíng?' ↛ 'How much money does Míngmíng have?'

(35) 明明 { 跟 / 像 } 他的 父亲 一样 有钱
míngmíng { gēn / xiàng } tā-de fù-qīn yī-yàng yǒu-qián
Míngmíng { with / similar } his father same rich(er)
Equative: 'Míngmíng is as rich as his father (is).' (see (25) and (26))

Examples in (29)–(35) illustrate the parallelism between gradable predicates and '*yǒu* + property noun' constructions. They demonstrate the same pattern of ambiguity (between a positive use and a comparative interpretation) and can be used in the same way in forming the positive use, *bǐ* comparatives, equatives, and degree questions.

There are a few issues to notice here. First, different from gradable predicates like 高 *gāo* 'tall, high', '*yǒu* + property noun' constructions are incompatible with measure phrases. Therefore, there are no measurement constructions (cf. (24b) and (28a)), and there cannot be numerical differentials in comparatives (cf. (20)).

Second, while the default positive use of 高 *gāo* 'tall, high' requires the presence of a semantically bleached 很 *hěn* (see Section 2.2), this requirement seems somehow loosened for many native speakers.[5]

Third, '*yǒu* + property noun' constructions are similar to negative antonyms like 矮 *ǎi* 'short' in assuming an evaluative presupposition for equatives (cf. (23)): i.e., here (33) and (35) presuppose that Míngmíng's father is rich (see the discussion on the evaluativity of negative antonyms in Rett 2015).

2.6 *Degree expressions based on mental verbs*

In Chinese, mental verbs like 爱 *ài* 'love', 喜欢 *xǐ-huān* 'like', 怕 *pà* 'fear', and 讨厌 *tǎo-yàn* 'dislike' can also be used in degree expressions, with patterns greatly similar to those based on gradable predicates or '*yǒu* + property noun' constructions.

[5] According to Y. Zhang (张伊文) (2020), '*yǒu* + property noun' constructions are parallel to gradable predicates like 高 *gāo* 'tall, high' in requiring the obligatory presence of 很 *hěn* in the default positive use. However, native speakers' intuition varies a lot on this issue. For some speakers, the presence of 很 *hěn* is not required (see, e.g., example (9a) in Li (李晓) 2019). For others, the presence of 很 *hěn* is related to the question-under-discussion (QUD) in a context, and '*yǒu* + property noun' constructions and gradable predicates like 高 *gāo* 'tall, high' might be different with regard to their most common QUD (see N.N. Zhang (张宁) 2021 and Sun (孙叶楠) (p.c.)). A thorough investigation is left for future research.

Example (36) is parallel with (13) (based on gradable predicate 高 *gāo* 'tall') and (29) (based on '*yǒu* + property noun' construction, 有钱 *yǒu-qián* 'rich'). With the use of degree modifier 更 *gèng*, sentences in (36) have an undoubted comparative reading. Without the use of 更 *gèng*, some speakers get only the positive interpretation, but, intriguingly, others claim that the comparative interpretation is also possible.

(36) With 更 *gèng*: # positive; ✓ comparative.
Without 更 *gèng*: ✓ positive; % comparative;

	(36a): Alternative question	(36b): to answer question (36a)
Positive	'Who loves reading, Míngmíng or Bèibèi?'	'Bèibèi loves reading.'
Comparative	'Who loves reading better, Míngmíng or Bèibèi?'	'Bèibèi loves reading better.'

a. 明明 (更) 爱 读书 还是 贝贝 (更) 爱 读书?
míngmíng (gèng) ài dú-shū hái-shì bèibèi (gèng) ài dú-shū
Míngmíng GENG love read-book or Bèibèi GENG love read-book

b. 贝贝 (更) 爱 读书
bèibèi (gèng) ài dú-shū
Bèibèi GENG love read-book

In general, degree expressions based on mental verbs, as illustrated in (37)–(42), show the same pattern as corresponding degree expressions based on gradable predicates (see Sections 2.2–2.4) and '*yǒu* + property noun' constructions (see Section 2.5).

Mental verbs are more similar to '*yǒu* + property noun' constructions (than to gradable predicates) in that (i) mental verbs are also incompatible with measure phrases, (ii) the positive use based on mental verbs does not require the presence of a semantically bleached 很 *hěn*, and (iii) mental-verb-based equatives are evaluative (see Section 2.5).

(37) a. 贝贝 爱 不 爱 读书?
bèibèi ài bù ài dú-shū
Bèibèi love NEG love read-book
A-not-A question: 'Does Bèibèi love reading?' ⇝ **Positive**

b. 贝贝 爱 读书
bèibèi ài dú-shū
Bèibèi love read-book
To answer question (37a): 'Bèibèi loves reading.' ⇝ **Positive**

(38) 我 { (很) / 非常 / 极其 / 相当 } 爱 延燕
wǒ { (hěn) / fēi-cháng / jí-qí / xiāng-dāng } ài yányàn
1-SG { (very) / extraodinarily / extremely / quite } love Yányàn
Positive: 'I love Yányàn { (very much) / very much / extremely /quite well}.'
(The presence of 很 *hěn* is not really required, and when present, it is not really semantically bleached.)

(39) 贝贝 比明明 (更) 爱 读 书
bèibèi bǐ míngmíng (gèng) ài dú shū
Bèibèi BI Míngmíng (better) love read book
Comparative: 'Bèibèi loves reading better than Míngmíng does.'
(更 *gèng* brings the presupposition that Míngmíng already loves reading.)

(40) 贝贝 有 我 那么 爱 读 书
bèibèi yǒu wǒ nà-me ài dú shū
Bèibèi have 1-SG that-kind love read book
Equative: 'Bèibèi loves reading as much as I do.'

(41) 贝贝 有 多 爱 读 书?
bèibèi yǒu duō ài dú shū
Bèibèi have many/much/more love read book
Degree question: 'To what extent does Bèibèi love reading?"

(42) 贝贝 { 跟 / 像 } 我 一样 爱 读 书
bèibèi { gēn / xiàng } wǒ yī-yàng ài dú shū
Bèibèi { with / similar } 1-SG same love read book
Equative: 'Bèibèi loves reading as much as I do.' (see (25) and (26))

2.7 *Interim summary*

The empirical data presented in this section is summarized in a table (43).

Evidently, gradable predicates, '*yǒu* + property noun' constructions, and mental verbs are highly parallel in forming degree expressions in Chinese. They all demonstrate an ambiguity between a positive and a comparative interpretation. There is less ambiguity for mental verbs (and even '*yǒu* + property noun' constructions): their positive reading is more readily available, loosening the requirement for a semantically bleached 很 *hěn* in the default positive use.

There is another distinction between gradable predicates, on the one hand, and mental verbs and property-noun-based expressions, on the other hand: the compatibility with measure phrases is limited to only (certain) gradable predicates.

(43) Summary of data:

	Gradable predicate 高 *gāo* 'tall'	**'*yǒu* + property noun'** 有钱 *yǒu-qián* 'rich'	**Mental verb** 爱 (读书) *ài* (*dú-shū*) 'love reading'
Ambiguity between positive and comparative	✓	✓	✓ for some speakers
Positive (+ degree modifiers)	✓	✓	✓
Requiring *hěn*?	Yes	Not really	No
***bǐ*-comparative**	✓	✓	✓
Transitive comparative	available for some predicates	—	—
***yǒu*-based equative**	✓	✓	✓
***yǒu*-based degree question**	✓	✓	✓
***gēn/xiàng*-based equative**	✓	✓	✓
Measurement construction	✓	—	—

Based on these data, the next three sections address existing formal semantics research on three fundamental issues: (i) the ambiguity issue and the encoding of comparison, (ii) compositional derivation, and (iii) underlying ontological assumptions.

3 Ambiguity between being positive and comparative

Languages like English make a morphological distinction between the comparative and the positive use of gradable adjectives: e.g., *taller* vs. *tall*. Bobaljik (2012) proposed the cross-linguistic generalization that the comparative form is either the same as or morphologically derived from the positive form. (Of course, according to *The World Atlas of Language Structures Online* (*WALS*, Stassen 2013), for most non-European languages, the comparative form is not distinct from the positive form.)

At first sight, given that the default way of expressing the positive meaning involves a semantically bleached morpheme 很 *hěn* (see Section 2.2), Chinese seems a counter-example to the generalization of Bobaljik (2012): e.g., the default positive form 很高 *hěn-gāo* 'tall, high' is derived from 高 *gāo*, which often has a comparative reading 'taller, higher'. However, the ambiguity of 高 *gāo* between meaning 'tall, high' and 'taller, higher' (see Section 2.1) suggests that the underlying story might not be so simple.

After all, how does this ambiguity get resolved? What exactly encodes the operation of comparison in Chinese? Why does the default way of expressing the positive meaning involve a semantically bleached 很 *hěn*?

To address these issues, existing studies can be divided into two lines: those at the **syntax-semantics** interface, and those at the **semantics-pragmaticx** interface.

3.1 *Accounts at the syntax-semantics interface*

Following the generalization of Bobaljik (2012), Grano (2012) and Liu (刘辰生) (2018), two representative accounts at the syntax-semantics interface, assumed that the same core semantics of gradable predicates, which is considered not including the operation of

comparison, underlines both the positive and comparative use (see (44)). Then the positive and comparative meanings are derived based on the use of silent or overt operators – POS and COMP (see (45) and (46)). Though Grano (2012) and Liu (刘辰生) (2018) basically agree on the lexical semantics of these operators POS and COMP, they differed with regard to the syntactic properties and semantic constraints of these operators.

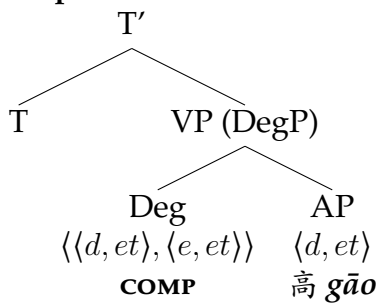
(44) **Gradable predicate**: $[\![\text{高 gāo}]\!]_{\langle d,et\rangle} \stackrel{\text{def}}{=} \lambda d.\lambda x.\textsc{height}(x) \geq d$ (see also (3b))
(A gradable predicate relates a degree and an individual.)
a. **Positive** meaning is derived from [[高 gāo]] + (silent or overt) [[POS]]
b. **Comparative** meaning is derived from [[高 gāo]] + (silent or overt) [[COMP]]

(45) **Positive operator**: $[\![\textsc{pos}]\!] \stackrel{\text{def}}{=} \lambda g_{\langle d,et\rangle}.\lambda x.\exists d[g(d)(x) \wedge d > s]$
(Here s denotes a silent, context-dependent free variable, representing a standard value for a certain comparison class along a relevant scale.)

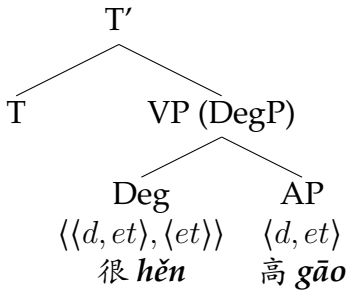
(46) **Comparative operator**: $[\![\textsc{comp}]\!] \stackrel{\text{def}}{=} \lambda g_{\langle d,et\rangle}.\lambda y.\lambda x.\exists d[g(d)(x) \wedge \neg g(d)(y)]$
(i.e., there exists a degree d such that the measurement of entity x reaches d along a scale associated with gradable predicate g, while the measurement of entity y does not reach this degree d along the same scale.)

According to Grano (2012), **(i)** a Chinese gradable predicate like 高 *gāo* 'tall(-er)' is syntactically an AP, smaller than a VP and unable to serve as the complement of a T head; **(ii)** comparative operator COMP is silent but syntactically visible in Chinese – as a projecting head, COMP heads a VP that can serve as the complement of a T head (see (47a)); **(iii)** however, silent positive operator POS does not syntactically project, and consequently, for the positive use, a semantically bleached 很 *hěn* is needed to merge with an AP and project to a VP, satisfying the c-selection requirement of T (see (47b)).

(47) a. **Comparative use**:



b. **Positive use**:

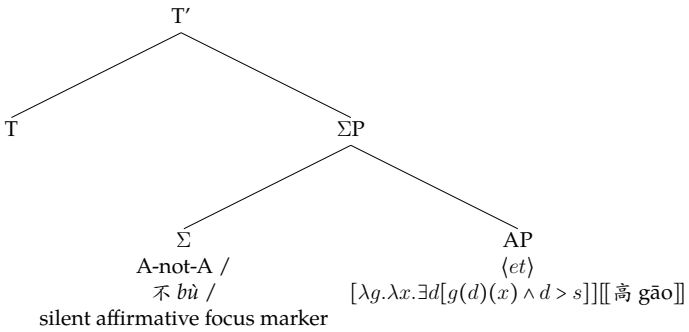


Under this approach, silent operators COMP and POS have different syntactic status: COMP is a zero affix, changing a gradable adjective into a verb, but POS is only a type-shifter. Thus Grano (2012) explained the obligatory presence of 很 *hěn* in the default positive use as a way of avoiding violating the c-selection requirement of T (see (48)).

(48) ?? 延燕 高
?? yányàn gāo
Yányàn tall(-er)
⇝ Without 很 *hěn*, the c-selection requirement of T is violated (cf. (17)).

Grano (2012) suggested that for the positive use, the obligatory presence of 很 *hěn* is similar to the phenomenon of *do*-support. In English, while *do* is syntactically needed in forming negative sentences (e.g., *he didn't come*) and questions (e.g., (*when*) *did he come?*), its presence is not required in positive sentences (e.g., *he came*), and when *do* indeed appears in a sentence like *he did come*, its presence brings an emphasizing meaning. This parallelism explains that 很 *hěn* is not required if there are other elements syntactically able to merge with an AP and project to satisfy the c-selection requirement of T: e.g., negation word 不 *bù* in (19a), an A-not-A construction in (14a), and a silent affirmative focus marker in (14b) (see (49)).[6] When 很 *hěn* indeed appears along with another element that syntactically projects, similar to the use of *do* in *he did come*, 很 *hěn* brings an intensifying meaning, raising the threshold of the standard, as illustrated in (19b).

(49) Syntax of (19a) – 不高 *bù gāo*, (14a) – 高不高 *gāo bù gāo*, and (14b) – 高 *gāo*:



Moreover, as addressed in Sections 2.5 and 2.6, for the positive use, '*yǒu* + property noun' constructions and mental-verb-based gradable predicates require the presence of 很 *hěn* to a lesser extent. Presumably, the c-selection requirement of T can already be satisfied by possessive verb 有 *yǒu* 'have' or mental verbs. Thus these data also provide support for this analysis (cf. Y. Zhang (张伊文) 2020).

However, the analysis of Grano (2012) predicted that the A-not-A question (50) should be similar to (19b), with the presence of 很 *hěn* bringing an intensifying meaning and leading to the interpretation 'Is Yányàn very tall?'. This prediction is nevertheless not borne out, and (50) is ungrammatical (cf. (51), which illustrates that a light verb like 打 *dǎ*, a V head, can be reduplicated to form an A-not-A question in Chinese).

(50) * 延燕 很 (高) 不 很 高?
* yányàn hěn (gāo) bù hěn gāo
Yányàn very (tall(-er)) not very tall(-er)

[6] In the term 'A-not-A', 'A' does not mean adjectives. 'A' is a verbal phrase or just its head (see C.-T. J. Huang (黄正德) et al. 2009 for a detailed discussion on the constructions 'VP-not-VP' and 'V-not-VP').

Intended reading: 'Is Yányàn very tall?' ⇝ 很高 *hěn gāo* does not seem a VP

(51) 你 打 (电话) 没 打 电话?
nǐ dǎ (diàn-huà) méi dǎ diàn-huà
you make/do (telephone) NEG make/do telephone
'Have you made a call?' ⇝ VP or V head can be used to form an A-not-A question

Liu (刘辰生) (2018) proposed that **(i)** syntactically, both positive and comparative operators in (45) and (46) are realized as projecting degree morphemes, heading a DegP (see also Liu (刘辰生) 2010b and N.N. Zhang (张宁) 2015); **(ii)** both the positive and comparative morphemes have an overt and a silent allomorph; **(iii)** the overt allomorph of POS is 很 *hěn*, and the overt allomorph of COMP is 比较 *bǐ-jiào*; **(iv)** overt comparative allomorph 比较 *bǐ-jiào* and silent POS are subject to distribution constraints in (52), which, according to Liu (刘辰生) (2018), follow independently motivated focus-related constraints in Chinese.[7]

(52) a. Overt 比较 *bǐ-jiào* is incompatible with other overt markers of comparatives.
b. Silent POS is only compatible with a focused gradable predicate.

Evidently, the empirical generalization that Chinese bare gradable predicates have a comparative reading can be explained by the availability of silent COMP, and the generalization that the default positive reading in Chinese needs the presence of 很 *hěn* can be explained by a limited distribution of silent POS (see (52b)).

In particular, the presence of 很 *hěn* is required in the default positive use because, in this kind of case, a gradable predicate is not focused. In a negative sentence like (19a) ('Yányàn is not tall'), with a gradable predicate targeted by a focus sensitive item – here negation word 不 *bù* – the presence of 很 *hěn* is not required.

[7] Liu (刘辰生) (2018) also mentioned that silent comparative allomorph COMP requires a syntactically overt standard of comparison. However, this view seems questionable and at odds with (13c), which has a clear comparative reading in its context but there is no syntactically overt comparison standard. It is unclear whether assuming an ellipsis of a syntactically overt comparison standard can be helpful without introducing over-generations.

With regard to the constraint on 比较 *bǐ-jiào* in (52a), Liu (刘辰生) (2018) focused on its incompatibility with overt comparison standards, and thus explained why the use of 比较 *bǐ-jiào* is ungrammatical in *bǐ*-comparatives and transitive comparatives (see Section 2.3). Other markers of comparatives, including overt numerical differentials or aspectual marker 了 *le*, are also incompatible with 比较 *bǐ-jiào*, as shown in example (i):

(i) (和 明明 相比) 延燕 比较 高 (*了) (*一寸)
(hé míngmíng xiāng-bǐ) yányàn bǐ-jiào gāo (*le) (*yī cùn)
(with Míngmíng compare) Yányàn COMP tall(-er) (*-PRF) (*1 inch)
'(Compared with Míngmíng), Yányàn is taller.' (For some speakers: 'Yányàn is relatively tall.')

Some native speakers' intuition suggests that 比较 *bǐ-jiào* might not be a comparative operator at all, but rather a degree modifier similar to English *relatively* or *comparatively*. For these speakers, (i) means rather 'Yányàn is relatively tall', i.e., a positive interpretation. These issues are left for another occasion.

The use of silent POS and silent COMP provides an account for the ambiguity of the sentence (13c)/(14b). In (14), the interpretation of the A-not-A question (14a) and its answer (14b) is built on the alternative set {tall, not tall}, and with a focused gradable predicate here, an overt 很 *hěn* is not required for the positive reading. In contrast, in (13), the questions (13a)/(13b) and their answer (13c) address who between Míngmíng and Yányàn is taller, and their interpretation is thus built on the alternative set {Yányàn, Míngmíng}. The gradable predicate is not focused in this case, ruling out the use of silent POS, thus leading to a comparative interpretation.

The connection between focus and a positive interpretation of bare gradable predicates is a great observation and worthy of further follow-up. However, the current analysis of Liu (刘辰生) (2018) also makes problematic predictions. For example, in (53), the question and the answer are built on the alternative set {mom, dad, …}, without focusing the gradable predicate 聪明 *cōngmíng* 'clever'. Thus the use of silent POS is predicted to be ruled out. However, (53) still has a clear positive reading.

(53) Q: 谁 夸 你 聪明? A: 妈妈 夸 我 聪明.
shéi kuā nǐ cōngmíng māmā kuā wǒ cōngmíng
who praise you clever(-er) mom praise me clever(-er)
'Who praises you for being clever?' 'Mom praises me for being clever.' ⇝ positive

Among other works addressing the syntax and/or semantics of 很 *hěn* and gradable predicates, precursors of Grano (2012)'s syntax-based account include Dong (董红源) (2005) and Gu (顾阳) (2008), which considered 很 *hěn* a kind of aspect/tense marker. N.N. Zhang (张宁) (2015) also provided more evidence arguing that syntactically, 很 *hěn* is a projecting head. The connection between focus and the interpretation of Chinese gradable predicates is also investigated in Liu (刘辰生) (2010b). Recently, N.N. Zhang (张宁) (2021) addressed a similar generalization on the connection between question-under-discussion (QUD) and the requirement of the presence of 很 *hěn*. In addition, S.-Z. Huang (黄师哲) (2006) analyzed gradable predicates as nominalized properties of type e and proposed that 很 *hěn* is a type-shifter (of type $\langle e, et\rangle$), turning nominalized properties into predicates of type $\langle et\rangle$, but the comparative use of gradable predicates is left unaccounted for.

It is worth noting that the view of requiring overt or silent operators to generate a positive/comparative interpretation of gradable predicates and considering 很 *hěn* a positive marker has been adopted by more works (e.g., Sybesma 1999, Lin (林若望) 2014, Cao (曹道根) and Hu (胡建华) 2020). However, in general, the positive reading is not overtly marked across languages, making such a view dubious (see Rett 2015 for more discussion on the positive reading).

3.2 *Accounts at the semantics-pragmatics interface*

Krasikova (2008) and L. Zhang (张琳敏) (2019), two accounts at the semantics-pragmatics interface, assumed that the core semantics of gradable predicates already includes the

meaning of comparison, and both the positive and comparative interpretation involve a contextually provided standard of comparison.

Both Krasikova (2008) and L. Zhang (张琳敏) (2019) analyzed the meaning of a gradable predicate as a relation among three items, addressing **the distance/difference** between the measurement of **an individual** and **a standard value** along a relevant scale (see (54)).[8] The distinction between the positive and the comparative interpretation consists in the standard of comparison. L. Zhang (张琳敏) (2019) pointed out that the standard involved in a comparative reading has discourse salience, and the standard involved in a positive reading lacks discourse salience (see also L. Zhang (张琳敏) and Ling (凌佳) 2021).

(54) $[\![\text{高 gāo}]\!]_{\langle d,\langle d,et\rangle\rangle} \stackrel{\text{def}}{=} \lambda\sigma_d.\lambda\delta_d.\lambda x_e.\textsc{height}(x) - \sigma = \delta$ (from L. Zhang (张琳敏) 2019)
σ: the **standard** in a comparison; δ: the **difference** in a comparison

	σ (standard)	δ (difference)
Positive	without discourse salience (often overtly marked by *hěn*)	always unspecified
Comparative	with discourse salience (covert or overt)	optionally specified (covert or overt)

Based on this understanding of gradable predicates, Krasikova (2008) analyzed 很 *hěn* as a modifier of the comparison standard σ, raising an original value σ to a higher, unspecified value σ' (see (55)). Thus the semantics of 很 *hěn* is the same as English *very*. With this unspecified standard σ', naturally, the distance to it can never be specified.

(55) $[\![\text{很 hěn}]\!]_{\langle dd\rangle} \stackrel{\text{def}}{=} \lambda\sigma_d.\sigma'$ (such that $\sigma' > \sigma$)

According to the pragmatic accounts of Krasikova (2008) and L. Zhang (张琳敏) (2019), (56a), which has a specified difference *1 inch*, is clearly a comparative sentence, and the interpretation requires a discourse salient standard value, pragmatically provided by HEIGHT(Míngmíng) here. In contrast, in (56b), the use of 很 *hěn* raises the standard from the contextually provided value HEIGHT(Měiměi) to an unspecified higher value, yielding a standard value without discourse salience and leading to a positive interpretation.

(56) a. 比起 明明， 延燕 高 一寸
bǐ-qǐ míngmíng yányàn gāo yī yīngcùn
compared-with Míngmíng Yányàn tall(-er) 1 inch
'Compared with Míngmíng, Yányàn is 1 inch **taller**.' ⇝ **Explicit comparison**

[8] The implementation of Krasikova (2008) is slightly different from the one in (54) and (55). In particular, Krasikova (2008) analyzed a comparison standard as an interval (of type $\langle dt\rangle$), which is adapted into a degree (of type d) in this article for presentation simplicity. See also L. Zhang (张琳敏) and Ling (凌佳) (2021) for an interval-based implementation.

Standard σ = HEIGHT(Míngmíng); **Difference** δ = 1″

b. 比起 美美，延燕很高
bǐ-qǐ měiměi yányàn hěn gāo
compared-with Měiměi Yányàn very tall(-er)
'Compared with Měiměi, Yányàn is **tall**.' ⇝ **Implicit comparison**
Standard σ is an unspecified value exceeding HEIGHT(Měiměi);
Difference δ is an unspecified positive value

Krasikova (2008) explained the requirement of 很 *hěn* in a positive sentence and its general absence in negation as a case of Grice's Quantity Maxim: Speakers prefer to make a strong claim. Thus the use of 很 *hěn* in a positive sentence does not make a substantial difference to truth conditions, but rather emphasizes the strength of the claim. Then in the negation of a positive sentence, because the use of 很 *hěn* weakens a claim (e.g., with $\sigma' > \sigma$, 'not taller than σ'' is less informative, i.e., weaker, than 'not taller than σ'), the emphasizing effect of 很 *hěn* is lost, and thus 很 *hěn* is generally absent.

L. Zhang (张琳敏) (2019) explained the practice of using 很 *hěn* as a kind of Rational Speech Act: Speakers and listeners reason about each other's reasoning to communicate **literal** and **likely** interpretations. Without 很 *hěn*, the literal interpretation of a gradable predicate is ambiguous between being positive and comparative. Because the use of 很 *hěn* can disambiguate and lead to a positive reading, if this disambiguating marker is not used, most likely, it is the comparative reading that interlocutors intend to convey. This mechanism explains why a bare gradable predicate is more likely to convey a comparative meaning and the presence of 很 *hěn* is often required in the expression of a positive meaning. L. Zhang (张琳敏) (2019) further extended this explanation to sentences with overt numerical differentials, accounting for their literal ambiguity between a comparative and a measurement reading and the mechanism of disambiguation.[9]

For the pragmatic accounts, a remaining issue is why such an emphasizing modifier like 很 *hěn* is not required in other languages. Presumably, in English, the use of comparative morpheme *-er*/*more* already contributes to making a distinction between a positive and comparative reading (as well as between explicit vs. implicit comparison, see the translation in (56)), and thus English *very* is not so much needed to play this kind

[9] As already explained in this section, under these semantics-pragmatics accounts, 很 *hěn* is a (weak) emphasizing modifier, not really a POS marker (cf. (45), as proposed by Grano 2012). Thus the use of 很 *hěn* as a default way of constructing the positive reading is not against the cross-linguistic observation that the POS operator is never overt. Thomas Grano (p.c.) raised the issue why Chinese recruits a word like 很 *hěn* to mark the positive reading, but not a word (e.g., 比较 *bǐ-jiào*, as proposed by Liu (刘辰生) 2018) to mark the comparative reading, and he further questioned whether this makes Chinese a special case cross-linguistically. I have three comments regarding his questions. First, the existence of this kind of emphasizing modifiers is not Chinese-specific (e.g., English has a similar word, *very*). Second, the use of comparative morphemes like English *-er* in marking the comparative reading is rather limited and almost an exclusively European phenomenon (see *WALS*, Stassen 2013). Third, as mentioned in note 7, in Chinese, whether 比较 *bǐ-jiào* marks the comparative reading is questionable. For many informants, 比较 *bǐ-jiào* is similar to English *relatively* or *comparatively* and used in positive-reading sentences.

of disambiguating role. However, the almost obligatory presence of such a disambiguating item like 很 *hěn* is not observed in other comparative-morpheme-less languages like Japanese or Korean either. Therefore, this issue remains.

Another related issue is why, even in Chinese, the presence of 很 *hěn* is required to a lesser extent in the positive interpretation of mental verbs and '*yǒu* + property noun' constructions. An answer to this issue might also help shed light on the cross-linguistic differences: there are three types of languages – (i) comparative-morpheme-less and *hěn*-needed languages like Chinese, (ii) comparative-morpheme-less languages like Japanese and Korean, (iii) languages like English that have comparative morphemes.

4 Compositional derivation of Chinese comparatives

4.1 *bǐ-comparatives: phrasal comparatives or clausal comparatives?*

English has two kinds of comparatives: **phrasal comparatives** and **clausal comparatives**, as evidenced by the contrast in (57). Example (57a) shows scope ambiguity, while (57b) does not, arguing against the view that (57a) is derived from (57b) with an ellipsis (see also e.g., Heim 1985, Larson 1988, Kennedy 1999, Schwarzchild and Wilkinson 2002).[10] Thus English data motivate two kinds of comparatives and two kinds of semantic analyses.

(57) a. Someone is smarter than everyone. **Phrasal comparative**: ✓∃ > ∀; ✓∀ > ∃
b. Someone is smarter than everyone is. **Clausal comparative**: ✓∃ > ∀; #∀ > ∃

As addressed in Section 1.1, based on the existence of subcomparatives, the semantic analysis of clausal comparatives involves (i) the assumption of elided gradable adjectives in *than* clauses, (ii) lambda abstraction over degree variables, and (iii) a comparison operator, *-er*, that works like a quantificational determiner (e.g., *every* of type $\langle\langle et\rangle,\langle et,t\rangle\rangle$) and relates two sets of degrees (see (58)). However, for a phrasal comparative, the points (i) and (ii) are not motivated, and *-er* is proposed to perform comparison directly between two individuals (see e.g., Heim 1985, Bhatt and Takahashi 2007, and implementations in (59)).

(58) In a clausal comparative, $[\![\text{-er}]\!]_{\langle\langle dt\rangle,\langle dt,t\rangle\rangle} \stackrel{\text{def}}{=} \lambda D_1.\lambda D_2.\exists d[d \in D_2 \wedge d \notin D_1]$ (see (7))

(59) In a phrasal comparative, $[\![\text{-er}]\!] \stackrel{\text{def}}{=} \lambda g_{\langle ed\rangle}.\lambda x.\lambda y.g(y) > g(x)$ (see (3a) for g)
Alternatively, $[\![\text{-er}]\!] \stackrel{\text{def}}{=} \lambda g_{\langle d,et\rangle}.\lambda x.\lambda y.\exists d[g(d)(y) \wedge \neg g(d)(x)]$ (see (3b) for g)

With regard to Chinese data, there has been a hot debate on how to compositionally derive the semantics of *bǐ*-comparatives: Are they phrasal comparatives or clausal

[10] Suppose that A is smarter than B in solving mathematical problems, while B is smarter than A in playing violin. Then the '∀ > ∃' reading of (57a) is true under this context, i.e., for each individual x, there is someone smarter than x. Clausal comparative (57b) lacks this inverse scope reading.

comparatives? More specifically, are there elided gradable predicates? Is there lambda abstraction over degree variables? What does a comparison operator do?

Advocates of the 'phrasal comparative' view include Xiang (向明) (2003, 2005), Erlewine (2007), Krasikova (2008), and Lin (林若望) (2009, 2022). There are at least two pieces of empirical evidence in support of this view. First, as illustrated in (60), subcomparatives are unavailable in Chinese, suggesting that *bǐ*-comparatives cannot involve a two-clausal construction with the ellipsis of one gradable predicate. Otherwise, an elided gradable predicate should be able to be put back, and at least one of (60a) and (60b) should be good. Second, as illustrated in (61), unlike English *than*, Chinese *bǐ* has to be followed by a nominal expression. In (61), the use of nominalization marker 的 *de* is obligatory, yielding a relative clause which literally means 'what I imagine'. The obligatory presence of this nominalization marker suggests that there are only *bǐ*-phrases, but no *bǐ*-clauses.

(60) Intended meaning: 'This table is longer than that door is wide.' (subcomparative)

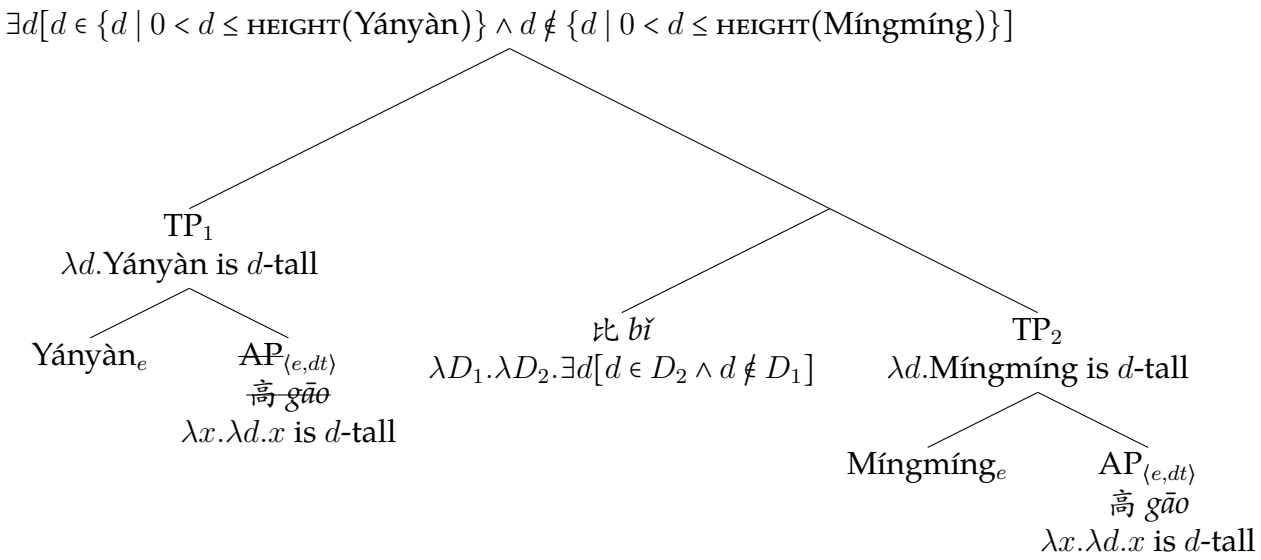
a. * 这 张 桌子 比那 扇 门 宽 长
zhè zhāng zhuō-zi bǐ nà shán mén kuān cháng
this CLASSIFIER table BI that CLASSIFIER door wide(-r) long(-er)

b. * 这 张 桌子 长 比那 扇 门 宽
zhè zhāng zhuō-zi cháng bǐ nà shán mén kuān
this CLASSIFIER table long(-er) BI that CLASSIFIER door wide(-r)

(61) 延燕 比我 想象 *(的) 富有
bùléinì bǐ wǒ xiǎng-xiàng *(de) fù-yǒu
Yányàn BI I imagine *(DE) rich(-er)
'Yányàn is richer than I imagine.' Literal: 'Yányàn is richer than what I imagine'

Advocates of the 'clausal comparative' view include Tsao (曹逢甫) (1989), Liu (刘辰生) (1996, 2011, 2014), Luo (罗琼鹏) (2017), Hsieh (谢易达) (2017), and Erlewine (2018). In Erlewine (2018), a recent analysis of this view, the derivation of a *bǐ*-comparative involves (i) a two-TP construction and (ii) the obligatory deletion of one instance of the gradable predicate. Lambda abstraction of a degree variable is not involved, because under this analysis, a gradable predicate first takes an individual argument (cf. (3b)), naturally resulting in a partially applied function of type $\langle dt \rangle$ (see (62)). The particle 比 *bǐ* performs comparison just as *-er* does in English clausal comparatives (see (58)). According to Erlewine (2018), the unavailability of subcomparatives is due to the obligatory deletion (of one instance of the gradable predicates): with this deletion, it is impossible to recover a gradable predicate different from the one overtly expressed (see (60)). However, Lin (林若望) (2022) pointed out that this is a stipulation: Why isn't there a similar obligatory deletion in English comparatives?

(62) 延燕 比明明 高
yányàn bǐ míngmíng gāo
Yányàn BI Míngmíng tall(-er)
'Yányàn is taller than Míngmíng (is).' (see (20))



Moreover, Lin (林若望) (2022) showed that the analysis of Erlewine (2018) leads to problematic predictions. For example, with a downward-entailing quantifier 没人 *méi rén* 'no one', (63) is predicted to be trivially true in any context, contradicting our intuition.

(63) 没人 比明明 富有
méi-rén bǐ míngmíng fù-yǒu
No-one BI Míngmíng rich(-er)
'No one is richer than Míngmíng (is).' ⇝ Míngmíng is the richest
Erlewine (2018)'s analysis:
$\exists d[d \in \{d \mid \neg\exists x[x \text{ is } d\text{-rich}]\} \wedge d \notin \{d \mid \text{Míngmíng is } d\text{-rich}\}]$
⇝ A too weak truth condition: true even in a context where Míngmíng is the poorest

It is worth noting that examples in (64) are often used to support the 'clausal comparative' view, because it seems difficult for a phrasal-based account to derive their meaning. Example (64a) compares 'how I did in today's math test' with 'how you did in yesterday's physics test', and each of the two bracketed parts needs to be interpreted along with 'did well/better in a/the test', suggesting a two-TP construction plus deletion. Similarly, (64b) compares 'how fast Zhāng Sān runs' with 'how fast an airplane flies', and each of the two bracketed parts needs the gradable predicate 快 *kuài* 'fast(er)' for interpretation. However, as claimed by Lin (林若望) (2022), a phrasal-based account does not necessarily require that compared items conjoined by 比 *bǐ* are themselves constituents.

(64) a. [我 今天 数学] 比[你 昨天 物理] 考 得 好
[wǒ jīn-tiān shù-xué] bǐ [nǐ zuó-tiān wù-lǐ] kǎo de hǒo
[I today math] BI [you yesterday physics] exam DE good/better
'I did better in today's math test than you did in yesterday's physics test.'

b. [张三 跑 得] 比[飞机 飞 得] 快
[zhāng-sān pǎo de] bǐ [fēi-jī fēi de] kuài
[Zhāng Sān run DE] BI [airplane fly DE] fast(-er)
'Zhāng Sān runs faster than an airplane flies.'

Presumably, as proposed in Krasikova (2008) and L. Zhang (张琳敏) (2019) (see Section 3.2), in a comparative, items undergoing comparison can be provided by context, instead of syntactically integrated into the structure of a sentence and involving lambda abstraction over degree variables. Combined with this view, a phrasal based account can also derive the semantics of (64a) and (64b) (see Lin (林若望) 2009 for an analysis of examples like (64a)). As for their syntax, examples in (64) are not cross-linguistically unique in conjoining parallel non-constituents. (65) is an English example. Here the two bracketed non-constituents are conjoined by *and*, and the interpretation of this sentence argues against a 'two-clause construction plus deletion' analysis (see e.g., L. Zhang (张琳敏) 2015, Kubota and Levine 2015 for more discussion).

(65) [Mary caught] and [John cooked] the same fish.
↛ Mary caught the same fish and John cooked the same fish.

Erlewine (2018)'s implementation of the 'clausal comparative' view also faces another issue. As shown in (62), gradable adjectives like 高 *gāo* do not actually perform comparison here, rather, it is the particle 比 *bǐ* that performs comparison. However, as already shown in Section 2.1, under a certain context, a Chinese gradable predicate can independently have a comparative reading, without relying on the presence of a *bǐ*-expression. Therefore, Erlewine (2018) also needs to explain why, in the same language, there exist two distinct words (比 *bǐ* and gradable predicates themselves) that can play the role of performing comparison.

To sum up, arguments in existing studies are in favor of the 'phrasal comparative' view for Chinese *bǐ*-comparatives. The compositional derivation of a *bǐ*-comparative does not involve elided gradable predicates or lambda abstraction over degree variables.

4.2 *Transitive comparatives*

Compared with other types of comparatives (e.g., the comparative reading of bare gradable predicates in (13) and *bǐ*-comparatives), bare transitive comparatives like (22a) are special in that they require an obligatory presence of measure phrases to specify differences. On the other hand, *yú*-comparatives like (22d) forbid the presence of measure phrases.

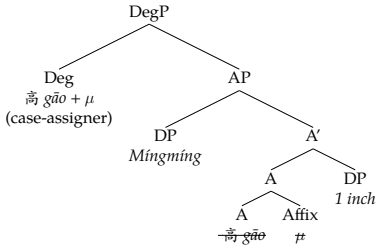
For bare transitive comparatives, Grano and Kennedy (2012) proposed a

case-assignment-based account, with the assumptions that (i) the DP serving as comparison standard needs to be assigned case, but (ii) Chinese gradable predicates like 高 *gāo* 'tall(-er)' are not transitive verbs themselves and cannot assign case. Thus the proposal of Grano and Kennedy (2012) consists of (i) taking away the degree argument slot from the core meaning of a gradable predicate (see (66a)) and (ii) using a covert morpheme μ that semantically introduces a degree argument for the measure phrase and syntactically assigns case to the comparison standard (see (66b)). The syntactic projection of μ is optional. Thus, as shown in (67) ('1 inch taller than Míngmíng'), with an A-to-Deg movement in (67a), μ projects, and '高 *gāo* + μ' directly assigns case to the standard DP, here *Míngmíng*; then without the projection of μ, 比 *bǐ* is inserted in (67b) to play the role of case-assigner.

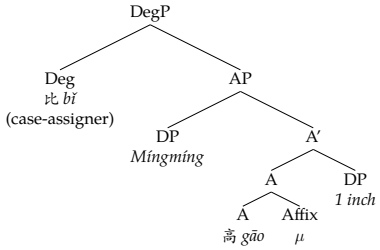
(66) a. $[\![\text{高 gāo}]\!]_{\langle ed\rangle} \overset{\text{def}}{=} \lambda x.\textsc{height}(x)$ i.e., $[\![\text{高 gāo}]\!]$ is simply a measure function

b. $\mu \overset{\text{def}}{=} \lambda g_{\langle ed\rangle}.\lambda d.\lambda x.\lambda y.g(y) - g(x) \geq d$ (adapted for presentation simplicity)

(67) a. **movement**: gāo Míngmíng 1″



b. **no movement**: bǐ Míngmíng gāo 1″



According to the analysis of Grano and Kennedy (2012), essentially, the proposal of μ is to satisfy a case assignment requirement, and μ's own need for a measure phrase to serve as its degree argument seems a by-product. However, with the analysis in (66), by taking away the degree argument slot from the meaning of a gradable adjective (see (66a)), μ is always needed for the introduction of a degree argument, even for bare gradable predicates with a comparative reading (See section 2.1) as well as *bǐ*-comparatives, where a measure phrase for specifying the differential is optional (see the table in (68)).

Then a dilemma arises. For bare gradable predicates or *bǐ*-comparatives, if we want to maintain a fully parallel analysis for sentences with vs. without an overt differential (e.g., à la Zhang (张琳敏) 2019 and Zhang (张琳敏) and Ling (凌佳) 2021), then we need to assume that a silent, unspecified measurement (or a contextually provided value) can serve as the degree argument of μ. As a consequence, we still leave the obligatory presence of a measure phrase in transitive comparatives unaccounted for. However, if we adopt the somewhat stipulative view that μ comes into use if and only if there is an overt measure phrase, then we have to abandon a fully parallel analysis for these constructions with vs. without an overt differential. Thus the justification of adopting this μ (along with its stipulation) in explaining the obligatory presence of an overt differential in

transitive comparatives needs further investigation.[11]

(68) Comparing various comparative constructions:

Constructions	**Overt differential?**	**Overt standard?**	**Case assigner?**	*更 gèng*?
bare gradable predicates	optional	no	NA	compatible
bǐ-comparatives	optional	yes	比 *bǐ*	compatible
bare transitive comparatives	required	yes	covert μ	incompatible
yú-comparatives	forbidden	yes	于 *yú*	incompatible

Xie (解志国) (2014b) also proposes a case-assignment-based account for the obligatory absence of measure phrases (i.e., differentials) in *yú*-comparatives. According to Xie (解志国) (2014b), in *yú*-comparatives, *yú* already assigns case to the comparison standard. Thus, the presence of an overt differential would mean the presence of μ (see (66)), another case assigner, and it is forbidden to have two case assigners (here μ and *yú*) for the same comparison standard.

These case-assignment-based accounts for the obligatory presence/absence of overt differentials do not explain whether these overt differentials (i.e., measure phrases) require case assignment themselves. If so, then Grano and Kennedy (2012) face another problem: while μ assigns case to the comparison standard, nothing assigns case to

[11] Thomas Grano (p.c.) questioned whether, for bare gradable predicates or *bǐ*-comparatives, a fully parallel analysis for sentences with vs. without an overt differential is desirable (see (ib) and (ii), where the overt differential '1 inch' is optional in both cases). There are two reasons to believe that a parallel analysis is reasonable in these cases. First, regardless of whether there is an overt differential (i.e., the specification of an amount of difference), these expressions convey the meaning of inequality between two measurements. Conceptually, the existence of a difference is a necessary element of inequality, whether the amount of the difference is specified or not. Second, there is no evidence showing that the presence/absence of an overt differential in (ib) or (ii) has syntactic consequences. In particular, the fact that transitive comparatives (or *yú*-comparatives) require (or forbid) the presence of an overt differential does not provide support for the view that the presence vs. the absence of an overt differential in sentences like (ib) or (ii) requires distinct syntactic analyses – one involving the use of μ and the other not.

(i) Context: Between Yányàn and Míngmíng, I wonder who is taller.

a. 他们俩 谁 高?
tā-men-liǎ shéi gāo
3-PL-two who tall(-er)
***Wh*-question**: 'Between the two, who is taller?'

b. 延燕 高 (一寸)
yányàn gāo (yī cùn)
Yányàn tall(-er) (1 inch)
'Yányàn is (1 inch) taller.' With vs. without an over differential: parallelism?

(ii) 延燕 比明明 高 (一寸)
yányàn bǐ míngmíng gāo (yī cùn)
Yányàn BI Míngmíng tall(-er) (1 inch)
'Yányàn is (1 inch) taller than Míngmíng (is).' With vs. without an over differential: parallelism?

measure phrases that serve as differentials.[12]

Another related issue is the incompatibility between the presence of 更 *gèng* and an overt measure phrase (see (21)). Grano and Kennedy (2012) claimed that this incompatibility explains why 更 *gèng* cannot be used in a bare transitive comparative, which always requires the overt presence of a measure phrase. However, this incompatibility itself is still a puzzle, given that 更 *gèng* is also incompatible with *yú*-comparatives, which do not contain an overt measure phrase (see (68), and see Liu (刘辰生) 2010a for more discussion on 更 *gèng*).

5 Ontological assumptions of scales and degrees

Comparatives in natural language support the expression of measurable differences, e.g., *Brienne is 1 inch taller than Jaime* addresses how much the difference between their heights is (see Section 1.1). Thus according to the theory of Stevens (1946) on the ontology of scales (see (69)), the semantics of comparatives requires scales equipped with not only ordering, but also units, i.e., interval scales. Do various Chinese degree expressions assume the same kind of ontology of scales and degrees? This section explores two groups of Chinese data that lead to reflections on the ontological assumptions of scales and degrees.

(69) Stevens (1946)'s 4-level distinction of scales:

Scales	**Examples**	**Mathematical properties**
nominal scales	postal codes	$\neq$ is defined
ordinal scales	my preference ranking of ice cream flavors	with **ordering** i.e., $>, \geq, <, \leq$ are defined
interval scales	time, temperature	with **ordering**, **units** i.e., differences are measurable
ratio scales	temporal length	with **ordering**, **units**, **absolute zero** i.e., supporting ratio equatives: *3 hours is 3 times as long as 1 hour.* (cf. # *3 o'clock is 3 times as late as 1 o'clock.*)

5.1 *Differential verbal comparatives and possessive-verb-based degree expressions*

Li (李晓) (2015) studied a special type of comparatives: **differential verbal comparatives**.[13] As illustrated in (70), a differential verbal comparative contains a non-gradable verb (here 读 *dú* 'read'), a gradable predicate 多 *duō* 'many/much/more' or 少 *shǎo* 'few/little/less', and a (definite) DP that serves as the differential (here *this*

[12] I thank an anonymous reviewer for raising this issue.

[13] Not all native speakers accept this type of comparatives, as indicated by the '%' marker in (70).

book or *Moby Dick*). These sentences express comparison between 'what he read' (the comparison standard) and 'what I read' and indicate that the difference consists in 'this book' (or '*Moby Dick*').

(70) Context: He read *Anna Karenina* and *The Great Gatsby*, while I read *Anna Karenina*, *The Great Gatsby*, and *Moby Dick*.

a. % 我 比他 多 读 了 { 这 本 书 / Moby Dick}
wǒ bǐ tā duō dú le { zhè běn shū / Moby Dick}
I BI he many/much/more read PRF { this CLASSIFIER book / Moby Dick}
'Compared to what he read, I read something more – { this book / *MD* }.'

b. % 他 比我 少 读 了 { 这 本 书 / Moby Dick }
tā bǐ wǒ duō dú le { zhè běn shū / Moby Dick }
he BI I few/little/less read PRF { this CLASSIFIER book / Moby Dick }
'Compared to what I read, he read something less – { this book / *MD* }.'

As pointed out by Li (李晓) (2015), the comparison in differential verbal comparatives is performed along **a scale of quantity/amount**, requiring the use of gradable predicates 多 *duō* 'many/much/more' or 少 *shǎo* 'few/little/less'. Other gradable predicates (e.g., 快 *kuài* 'fast(-er)') cannot be used to form differential verbal comparatives. The differential is not necessarily a definite DP. Indefinite DPs like 一本书 *yī běn shū* 'one book' or measure phrases like 三页 *sān yè* 'three pages' can serve as differential as well.

Li (李晓) (2015) proposed a degreeless account for (70a). As shown in (71), there is some entity y such that (i) 'y is *Moby Dick*' and 'I read y' hold true, and (ii) for each entity x such that 'he read x' holds true, there is a corresponding x' such that (ii-a) 'I read x'' also holds true, and (ii-b) there is no overlap between x' and y.[14]

(71) $[\![$(70a)$]\!] \Leftrightarrow \exists y[y =$ MD $\wedge$ read(I)$(y) \wedge \forall x[$read(he)$(x) \rightarrow$
$\exists x'[$read(I)$(x') \wedge$ x' corresponds to x $\wedge$ no overlap between x' and $y]]]$

Under this analysis, comparison involves (i) a correspondence mapping and (ii) the notion of non-overlap in mereology (similar to set difference in set theory). A definite DP that serves as the differential (e.g., *this book* in (70a)) refers to a non-overlap part. Thus items undergoing comparison (e.g., 'what I read', AK $\oplus$ GG $\oplus$ MD, vs. 'what he read', AK $\oplus$ GG) are not elements of an interval scale (i.e., number-like degrees).

Can this 'degree-less comparison' view be extended to account for other degree expressions so that eventually, the assumption of interval scales can be dropped?

As illustrated by measurement/possession constructions in (72) and degree

[14]The establishment of corresponding mapping is often context-dependent. Suppose I read *Emma* and *Ulysses*, and he read *Middlemarch*. *Compared to what he read, I read something more – Emma* is false here, because when the differential, *Emma*, is a specific novel, it seems problematic to establish a mapping between *Ulysses* and *Middlemarch*. However, *I read one more novel than he did* is true under this context. Here the differential is *one novel*, with details ignored, making it easy to establish a correspondence mapping between the one novel he read and one of the two novels I read (see Li (李晓) 2015 for more discussion).

questions on degrees/quantities in (73), there is a parallelism between possessive-verb-based degree expressions and possession expressions, suggesting that Chinese gradable predicates can be considered mass nouns and analyzed in terms of possession (see also Xie (解志国) 2014a, Li (李晓) 2019).[15]

(72) a. 延燕 有 6 尺 高
yányàn yǒu 6 chǐ gāo
Yányàn have 6 foot tall(-er)
Measurement construction: 'Yányàn has 6 feet of tallness.' ⇝ 'She is 6' tall.'

b. 延燕 有 3 匹 马
yányàn yǒu 3 pǐ mǎ
Yányàn have 3 CLASSIFER horse
Possession construction: 'Yányàn has 3 horses.'

(73) a. 延燕 有 多 高?
yányàn yǒu duō gāo(er)
Yányàn have many/much/more tall(-er)
Degree q.: 'How much tallness does Yányàn have?' ⇝ 'How tall is she?'

b. 延燕 有 几 尺 高?
yányàn yǒu jǐ chǐ gāo(er)
Yányàn have what-number foot tall(-er)
Degree q.: 'How many feet of tallness does she have?' ⇝ 'How tall is she?'

c. 延燕 有 几 匹 马?
yányàn yǒu jǐ pǐ mǎ
Yányàn have what-number CLASSIFIER horse
Degree q.: 'How many horses does Yányàn have?'

With this view, a comparative like (74) compares 'how much tallness Brienne has' and 'how much tallness Jaime has', meaning that the measurement of a non-overlap part between these two items under comparison is 1 inch.

(74) Brienne is 1 inch taller than Jaime.
⇝ Brienne has 1 inch more tallness than Jaime has.
$[\![(74)]\!] \Leftrightarrow \exists y[\mu(y) = 1'' \wedge \text{tallness}(y) \wedge \text{possess(Br)}(y) \wedge \forall x[\text{possess(Ja)}(x) \rightarrow \exists x'[\text{possess(Br)}(x') \wedge$ x' corresponds to x $\wedge$ no overlap between x' and $y]]]$

Compared to differential verbal comparatives in (70), comparison in (74) involves not only a correspondence mapping and the notion of non-overlap, but also a measure function μ. What then is the ontological assumption of μ? This issue is still under debate.

[15] The '*yǒu* + property noun' constructions (see Section 2.5) also seem to provide support for this view (though see Francez and Koontz-Garboden 2017 for a more detailed discussion). However, as pointed out by Thomas Grano (p.c.), although property nouns like 智慧 *zhì-huì* 'wisdom' should be analyzed as mass nouns, do the examples in (72) and (73) suggest that gradable predicates like 高 *gāo* 'tall/taller' should be considered mass nouns as well? It is not unlikely that 高 *gāo* 'tall/taller' is syntactic-category-fluid, but a thorough investigation is beyond the scope of this article.

On the one hand, if the output set of a measure function needs only to have orderings (i.e., an ordered set of equivalence classes), then the assumption of ordinal scales is sufficient (see e.g., Cresswell 1976).

On the other hand, given that the use of this measure function μ in comparative sentences like (74) conceptually relies on the existence of a non-overlap, the existence of an absolute zero is assumed. According to Stevens (1946) (see (69)), this means that the assumption of ratio scales is necessary (see Li (李晓) 2019). Based on data like *this horse is twice as tall as that dog* (dubbed as ratio equatives), Sassoon (2010) argued that the assumption of ratio scales is needed in natural language semantics anyway. Thus most likely, even though differential verbal comparatives lead to a new analysis of comparatives, the assumption of interval scales (or even ratio scales) cannot be dropped.

5.2 *Equatives with a metaphorical reading*

Although the assumption of interval scales and a 'degree as number' view is needed in natural language (see the discussion in Section 5.1), based on Chinese *xiàng*-equatives (see (26b), repeated here as (75)), L. Zhang (张琳敏) (2020) argued that another ontology of scales and degrees is also needed.

The most natural interpretation of (75) is a metaphorical reading, felicitous and true under a context where Yányàn measures 6 feet 3 inches tall, while mountains are generally above 1000 feet. *Xiàng*-equative (75) does not mean that Yányàn and mountains literally have the same degree along a scale of height, but rather that they give **the same kind of impression** in being tall, with the same **manner** (i.e., **qualitatively similar** in being, e.g., strong, firm, and reliable) and to the same **extent** (i.e., **quantitatively similar** in being impressive – among humans, Yányàn is impressively tall, while among various objects, mountains are also impressively tall).

(75) 延燕 像 山 一样 高
yányàn xiàng shān yī-yàng gāo
Yányàn similar mountain same tall(-er)
'Yányàn is as tall as a mountain (is).' ⇝ metaphorical interpretation

This metaphorical reading would be impossible if degrees in natural language semantics are always number-like items on a single-dimensional scale. Thus L. Zhang (张琳敏) (2020) proposed a dual ontology of degrees. While comparatives with numerical differentials require **single-dimensional** interval scales (i.e., scales with units) and **number-like degrees**, *xiàng*-equatives require rather **multi-dimensional** scales and **kind-like degrees** (see e.g., Anderson and Morzycki 2015 for more discussion).

6 General discussion

Compared with the canonical theory of degree semantics (see (9)), research on Chinese degree phenomena raises at least two crucial questions: (i) How is comparison performed? (ii) Does a comparative morpheme like English *-er* perform comparison?

For the first question, within the canonical theory, comparison essentially means computing/measuring **the difference between two measurements**. For the difference to be computable or measurable, the two measurements undergoing comparison need to be degrees on the same interval scale. Then according to Li (李晓) (2015), comparison essentially means **the measurement of a (non-overlapping) difference**. Thus what undergoes comparison is not degrees, but rather two entities or mass-like objects, and only one measurement (i.e., mapping a non-overlap part to a degree value) eventually takes place. The view of Li (李晓) (2015) is based on part-whole relationship, but when items like temperatures or time points are involved in comparison, it is questionable whether there is part-whole relationship between items under comparison (e.g., for (76b), suppose the scheduled arrival time of the train is 3:05, then it is conceptually weird to consider that the actual arrival at 3:00 possesses any lateness or even more lateness than my leaving).

(76) a. Moscow is cold now, but still 5 degrees warmer than Montreal.
b. The train arrived at 3 o'clock, 1 hour later than I left the station.

However, the view of Li (李晓) (2015) indeed contributed new insight on cross-linguistic comparison-related phenomena. The comparison in (77) addresses a non-overlapping part in a part-whole relationship, between depression and the entirety brought by war (see also Thomas 2010, Greenberg 2010, L. Zhang (张琳敏) and Ling (凌佳) 2021 for relevant discussion).

(77) War brings depression. What is **more**, it brings chaos.

For the second question, within the canonical theory, comparative morphemes like English *-er* have a semantics of type $\langle \alpha, \alpha t \rangle$, relating items under comparison and performing comparison between them. However, according to Krasikova (2008) and L. Zhang (张琳敏) (2019), gradable predicates already include the meaning of comparison, and no further overt operator is needed. Then for languages with an overt comparative morpheme, do their gradable predicates also include the meaning of comparison? If so, why is comparison still overtly marked by comparative morphemes?

The often adopted lexical semantics of English gradable adjectives (see (78)) already includes a comparison operator '$\geq$'. Examples like (77) and (79) also suggest that comparative morphemes probably should not be analyzed as an operator of type $\langle \alpha, \alpha t \rangle$.

(78) $[\![\text{tall}]\!] \stackrel{\text{def}}{=} \lambda d.\lambda x.\textsc{height}(x) \geq d$ (= (3b))

(79) The sooner the better.

$\rightsquigarrow$ *-er* means a differential or increase, and here one increase correlates with another increase (see also Brasoveanu 2008 for more discussion).

If comparative morphemes like *-er* are not themselves comparison operators, what would be their semantic contribution? Examples like (77) and (80) suggest that the meaning of *more* is similar to that of *another* in bringing an additive presupposition: both words mark increases on a presupposed value or entity. L. Zhang (张琳敏) and Ling (凌佳) (2021) adopted this view on English *-er* and developed a new analysis of English comparatives.

(80) a. Mary ate **an** apple and drank **some** water. **without presupposition**
b. Mary ate **another** apple and drank **more** water. **with presupposition**

Under the canonical view on comparative morphemes, Chinese lacks such morphemes that work as comparison operator (of type $\langle \alpha, \alpha t \rangle$). If comparison is never performed by an overt operator, and morphemes like *-er* are actually similar to *another* in bringing an additive presupposition, then Chinese seems to have a counterpart of English *-er*. Liu (刘辰生) (2010a) claimed that 更 *gèng* is a presupposition trigger in Chinese comparatives (see (21)), bringing a meaning similar to what *even* does in English. The similarities and differences between Chinese 更 *gèng* and English *-er* need to be further investigated.

Finally, the canonical view on *-er* leads to a parallelism between comparison operator (of type $\langle \langle dt \rangle, \langle dt, t \rangle \rangle$) and quantificational determiners (of type $\langle \langle et \rangle, \langle et, t \rangle \rangle$), which further implicate the analysis of the compositional derivation of comparatives. On this issue, Beck et al. (2009) proposes that languages vary on whether they allow for lambda abstraction over degree variables. A new view on the semantics of *-er* also invites a rethinking of this parameter. Presumably, lambda abstraction over degree variables is motivated only by the syntax of English clausal comparatives, but is not a necessary component in the encoding of comparison in natural language.

7 Concluding remarks

In conclusion, this article presents major empirical data on degree expressions in Mandarin Chinese, focusing on the ambiguous interpretations of gradable predicates, the obligatory presence of 很 *hěn* in the default positive use, comparatives (e.g., *bǐ*-comparatives and various transitive comparatives), equatives (e.g., possessive-verb-based constructions, *gēn*/*xàng*-equatives), and degree expressions based on mental verbs or '*yǒu* + property noun' constructions. Based on these data, this article also surveys existing studies on three fundamental issues: the encoding of comparison, compositional derivation, and underlying ontological assumptions.

To this date, many specific research questions are still hotly debated. In particular, the obligatory presence of 很 *hěn* in the default positive use and the obligatory presence

of numerical differentials in bare transitive comparatives are two great mysteries not fully solved.

This article also invites rethinking on cross-linguistic variations of degree expressions. How pragmatics is involved in degree expressions for comparative-morpheme-less languages (e.g., Chinese, Japanese, Korean) is an important topic for future research. For languages with comparative morphemes (e.g., English, French), whether comparative morphemes are operators of comparison or markers carrying other functions is worth further investigation.

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Further reading

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