Degrees as Nominalized Properties: Evidence from Differential Verbal Comparatives in Mandarin

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Background: One popular theory of degree semantics treats degrees as points (or intervals) on a scale, analogous to real numbers. Comparisons are constructed out of scales: individuals are mapped onto scales, and the relative positions of the individuals on the scale determine the comparison outcome (Scontras 2017; see also von Stechow 1984; Kennedy & McNally 2005; Morzycki 2016, a. o.). However, recent research has identified Differential Verbal Comparatives (DVCs) in Mandarin to be a case that challenges this standard knowledge (1) (Li 2009, 2015; Lin 2013; Liu 2013):

(1) a. DP₁ bi DP₂ duo/shao V *(differential phrase)
    b. Zhangsan bi Lisi duo/shao kan-le liang ben xiaoshuo.
      Zhangsan bi Lisi more/less read-Asp two CL novel

‘Zhangsan read two more novels than Lisi did.’

The differential in (1b) is obligatory, and it takes the form of a DP (liang ben xiaoshuo ‘two CL novels’).

On the standard degree-based account, differentials denote difference between the target of comparison and the standard of comparison. This means liang-ben xiaoshuo in (1b) should denote a set of numbers (that ZS read but LS didn’t read)! As the gloss in (1b) indicates, (to borrow from Grosu & Landman (1998)), “it just can’t be correct”.

Li’s degreeless analysis: Taking certain differential phrases in DVC sentences as “regular,” individual-denoting DPs, Li (2009, 2015) holds that a degree-based semantic analysis would fail short of the DVC, and that the construction is amenable to a degreeless, mapping-based semantics that compares the entities in two sets. She posits the semantics in (2a) for duo, which involves a bijective mapping between two sets of entities to which the subject (i.e. DP₁ in (1a)) and the standard of comparison (DP₂) relate by the predicate (V). It identifies the difference between the sets with the denotation of the differential phrase. For (1b), Li assumes (2b) to be its LP structure, where bi projects a PP and is semantically vacuous. DP₂ is taken to be a simple PP complement, with no clausal syntactic structure. The semantics of (1b) is given in (2c), which says that for each novel Lisi read, Zhangsan read a matching copy, and there are two novels that Zhangsan read but for which Lisi did not read matching copies.

(2) a. [duo] = λP<e,ε>λx₁λy₁λk₆.∀z₆[P[z₆]→∃t₁=[g(f(z₆))]∧Γ propriety(g(f)) ∧ A[τ (z₆) ∧ A[P(k₆) o] ∧ τ (g)]]
    b. [DP liang ben xiaoshuo] = λx₁[VP [DP Zhangsan] [VP [PP [DP bi] [DP Lisi]]]] [VP [duo kan-le t₁]…
    c. [[1(b)]] = 1 iff ∃x₆[novel(x) ∧ #x₂≥2 ∧ ∃z₆[read(t)(Lisi)] → ∃t₁=[g(f(z₆))] ∧ PROPER(g(f)) ∧ read(t)(Zhangsan) ∧ read(t)(Zhangsan) ∧ ¬τ (g)]

Empirical issues: Li’s (2009/15) mapping-based analysis of the DVC is largely motivated by the observation that when the differential phrase in the DVC is not a measure phrase (MP), it shares certain properties with DP objects that purport to denote individuals. However, we note that her arguments are actually less conclusive than what she had intended, and that the following observations can be taken to be evidence setting non-MP differential phrases in DVC sentences apart from genuine DPs. (a) A non-MP differential phrase in the DVC at best can be marginally referred back to by a (referential) pronoun or empty category, while referring back by a degree modifier such as zhe(me) or na(me) ‘this/that’ plus an MP is always acceptable (3). (b) When the differential phrase in the DVC is a numeral + classifier phrase, it can be preceded by the degree-modifying na(me), a modifier that cannot precede a genuine DP (4). (c) Unlike genuine DPs, a non-MP differential in the DVC cannot be topicalized, even if it is preceded by a demonstrative (5).

      Zhangsan bi Lisi more read-Asp two CL novel Wangwu also read-Asp them
      Intended: ‘Zhangsan read two more novels than Lisi did. And Wangwu read them, too.’
    b. Zhangsan bi Lisi duo du-le [liang ben xiaoshuo]. Wangwu ye du-le [na/me], liang-ben.
      Zhangsan bi Lisi more read-Asp two CL novel Wangwu also read-Asp that DUO
      ‘Zhangsan read two more novels than Lisi did. And Wangwu read that many (more) too.’

(4) Jisuani zhuanye bi women duo shang na/me san-men ke.
    computer major bi we more study so three-CL course
    ‘Computer science majors (merely) take three more courses than we do.’

(5) a. Zhangsan bi Lisi duo du-le zhe ben xiaoshuo.
      Zhangsan bi Lisi more read-Asp Dem CL novel
b. */?? [Topic: Zhe ben xiaoshuo], Zhangsan bi Lisi duo du-le e.

As a further note, degree-denoting DPs are widely attested in natural languages, most of them are typologically unrelated to Mandarin Chinese: English (6) (Rett 2014); Hindi-Urdu (7) (Bhatt and Takahashi 2011), Japanese (8) (Sudo 2015):

(6) a. Four pizzas is more than we need. b. Many guests is several more than Bill anticipated.
(7) [Pim-ne kal jìmì par-i:] [Tina ne aa] us-se zyadaa kitaab par-i:]
Pim yesterday how many books read Tina-Erg today that more books read-Pfv.FPI
Lit: ‘How many books Pim read yesterday, Tina read more books than that today.’
(8) John-wa [[ Bill-ga katta ]-yori ] takusan hon-o katta
John-top Bill-nom bought-more than many book-acc bought
‘John bought more books than the amount of books that Bill bought.’

Proposal: Cresswell (1976) conjectures that DPs can denote either a set of individuals or the cardinality of that set. To implement this classic thesis, we follow Anderson & Morzycki (2015) and Scontras (2017) to assume that degrees are more ontologically complex than are typically thought: they are nominalizations of quantity-uniform properties, namely, degrees reference both abstract representation of measurement and the objects in the world that instantiate that measurement (9a). Specifically, the degree-denoting DPs contain a null ∆ morpheme that turns a set of individuals to an n-membered set of individuals (cf. Scontras’ (2017) treatment of amount) (9b-c) (‘<‘ and ‘>‘ are the familiar operators that turn properties to kinds and vice versa, cf. Chierchia 1998):

(9) a. DEGREE := ∆x.3k[μ(x) = n ∧ ∼k(x)] (where k is kind, μ is a contextually-specified measure)

b. [D] = ∆k,x.n.d. d = ∆x.μ(x) = n ∧ ∼k(x)

c. [DP [CNP [number liang [c ben ∆ [np xiaoshuo]]]]] = λd. d = ∆x.μ(x) = 2 ∧ ∼[novel](x)

(9c) amounts to saying that there is a 2-membered set of individuals which is instantiated by the kind NOVEL. Direct support for this (degrees-as-kinds) analysis comes from the fact that differentials in DVCs can be kind-denoting terms (in (10a), Pride and Prejudice denotes a novel kind, as evidenced by its modification by a Num+Cl sequence):

(10) Zhangsan bi Lisi duo kan-le yi-ben Pride and Prejudice. (Li 2015)

One immediate advantage of this analysis is that it provides a unified account of the degree-denoting DPs and individual-denoting DPs. Via the familiar process of DKP (Derived Kind Predication) (Chierchia 1998), degrees grant us access to the individuals that instantiate them (DKP: If P applies to objects and k denotes a kind, then P(k) = ∃x (∼k(x) ∧ P(x))).

This analysis offers a more motivated account of DVC sentences. First, the fact that the differential DP in the DVC can be preceded by the degree modifying zhe(me)/na(me) ‘this/that’ is straightforwardly captured. In Mandarin, zhe(me)/na(me) are etymologically and semantically related to the demonstrative zhe/na. Demonstratives contain a semantic component about maximality (λA. tA (the largest member of A if there is one)) and reference to some salient objects. They can combine with a set of degrees and return the largest degree. The semantic representation of na(me) liang ben xiaoshuo ‘that two CL novels’ is provided in (11):

(11) [[name liang ben xiaoshuo]] = λd. d = ∆x.μ(x) = 2 ∧ [[novel]](x) = ∆x.μ(x) = n_{+} ∧ ¬NOVEL(x)

Second, the present analysis predicts that the differential DPs are obligatory in DVC sentences, because on the present account, degrees contain both abstract measurement and the information about the sortal predicates that instantiate it. This prediction is borne out (see Li 2015 for details). Third, the present analysis correctly delivers the truth-conditions of DVC sentences without running into the difficulties the standard degree-based account would face. We take duo to be a difference function that takes five arguments: an object x (the standard of comparison), an object y (the target of comparison), a predicate P that relates events and objects, a degree d, and an event e (Svenonius & Kennedy 2006; Kennedy & Levin 2008) (12):

(12) a. [[duo]] = λP.λx.λy.λd.λu.λv.P(e)(u)(d)(x)(v) (an object y is different from x relative to P such that y holds of P bud x does not)

b. P (d)(x) = 1 iff ∃d ∈ D_d(¬d)[P(¬d)(y) = 1 ∧ P(¬d)(x) = 0]

Applying the standard A-not-A analysis for comparisons (Schwarzschild 2008) yields the desired results for DVC sentences (simplifying somewhat):

(13) [[zhangsan bi Lisi duo le san ben shu]] = 1 iff ∃d ∈ D_d(¬d)[P(¬d)(ZS) = 1 ∧ P(¬d)(LS) = 0]

= ∃x[μ(x) = 3 ∧ BOOK(x) ∧ [read(x)(ZS) ∧ ¬read(x)(LS)]]
In prose, (13) states that there is some instantiation x of BOOK kind whose cardinality is 3 such that Zhangsan read x but Lisi did not read (the same thing). This semantics is logically equivalent to what is obtained in Li (2015), but free from her problems.

**Conclusion and implications:** Recent research has documented remarkable variability in the expression of comparison (Beck et al. 2004; Kennedy 2009; Bhatt and Takahashi 2011; Bochnak 2015). There are two driving questions behind this line of research: (1) whether a case of apparent surface variability in making comparison reflects variability in grammar, (2) which component of grammar (if any) can a case of variability in comparison be reduced to. In this paper, we reexamined Differential Verbal Comparatives in Mandarin, a comparative construction purportedly making use of direct comparison of two sets of individuals with no reference to, or mediation by, degree. We have shown that this unnatural bifurcation of degree-based vs. degreeless comparatives can be eliminated, provided we allow a richer semantics of DPs and an complex ontology of degrees: the former requires us to admit that DPs denote degrees and the latter forces us to model degrees as (abstract) representation of measurement plus the objects in the world that instantiate that measurement.