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. DP_1 *bi* DP_2 *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 fall 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. DP_1 in (1a)) and the standard of comparison (DP_2) 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 LF structure, where *bi* projects a PP and is semantically vacuous. DP_2 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. $[\![duo_f]\!]^g = \lambda P_{<e,<et>>}\lambda x_e\lambda y_e\lambda k_e.\forall z_e[P(z)(y)\rightarrow\exists t_e[t=g(f)(z)\wedge proper(g(f)) \wedge P(t)(x)\wedge P(k)(o)\wedge\neg t\circ k]]$

    b. $[_S [_{DP}$ liang ben xiaoshuo$]_i [_S \lambda i [_{VP} [_{DP1}$ Zhangsan$] [_{VP} [_{PP} [_P$ bi$][_{DP2}$ Lisi$]]][_{VP} [$ duo kan-le $t_i]...$

    c. $[\![(1b)]\!]=1$ iff $\exists x_e[novel (x)\wedge\#x\geq2\wedge\forall z_e[read(z)(Lisi) \rightarrow$
       $\exists t_e[t=g(f)(z) \wedge PROPER(g(f)) \wedge read(t)(Zhangsan) \wedge read(x)(Zhangsan) \wedge\neg t\circ x]]]$

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 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).

(3) a. Zhangsan bi Lisi duo   du-le   [liang ben xiaoshuo]$_i$. ??/*Wangwu ye   du-le   [tamen]$_i$.
       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]$_i$. Wangwu ye   du-le   [na'me]$_i$ 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) Jisuanji   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   jitnii kitaabe parh-i:]   [Tina-ne aaj   us-se   zyaadaa kitaabe parh-i:].
    Pim yesterday how.many books read   Tina-Erg today that-than more   books   read-Pfv.FPl
    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-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 Δ morpheme that turns a set of individuals to an *n*-membered set of individuals (cf. Scontras' (2017) treatment of *amount*) (9b-c) ("$^\cap$" and "$^\cup$" are the familiar operators that turn properties to kinds and vice versa, cf. Chierchia 1998):

(9) a. DEGREE := $^\cap\lambda x.\exists k[\mu_f(x)=n \wedge {}^\cup k(x)]$ (where k is kind, μ_f is a contextually-specified measure)

    b. $[\![\Delta]\!]= \lambda k\lambda n\lambda d.d={}^\cap\lambda x.\mu_f(x)=n \wedge {}^\cup k(x)$

    c. $[_{DP} [_{CIP} [_{NumeralP} $ liang $[_{Cl}$ ben $[\Delta [_{NP}$ xiaoshuo$]]]]]]= \lambda d. d={}^\cap\lambda x.\mu_{CARD}(x)=2 \wedge {}^\cup [\![novel]\!](x)$

(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)
    Zhangsan bi Lisi more read-Asp (one-CL) *Pride and Prejudice*

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 $P(k) = \exists x[{}^\cup k(x)\wedge P(x)]$).

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 ($\lambda A. \iota A$ (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) $[\![name\ liang\ ben\ xiaoshuo]\!] = \iota\lambda d. d={}^\cap\lambda x.\mu_f(x)=2 \wedge [\![novel]\!](x) = {}^\cap\lambda x. \mu_f(x)=n_{a+b}\wedge{}^\cup NOVEL(x)$

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. $[\![duo]\!]= \lambda P_{<v, et>}\lambda d\lambda x_e\lambda y_e\lambda e_v.P(e)(u)({}^\cup d)\overset{\uparrow}{\underset{x}{-}}(y)$ (an object y is different from x relative to P such that y holds of P bud x does not)

    b. $P ({}^\cup d)\overset{\uparrow}{\underset{x}{-}}(y) =1$ iff $\exists d\in D_{\overset{\geq}{n}}({}^\cup d)[P({}^\cup d)(y)=1\wedge P({}^\cup d)(x)=0]$

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

(13) $[\![zhangsan\ bi\ Lisi\ duo\ du\ le\ san\ ben\ shu]\!] =1$ iff $\exists d\in D_{\overset{\geq}{n}}({}^\cup d)[P({}^\cup d)(ZS)=1\wedge P({}^\cup d)(LS)=0]$
    $= \exists x[\mu_f(x)=3\wedge{}^\cup BOOK(x) \wedge [\mathbf{read}\ (x)(ZS) \wedge \neg\mathbf{read}\ (x)(LS)]]$

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.

References: Anderson, C. & M. Morzycki. 2015. Degrees as kinds. *NL&LT* 33(3). // Chierchia, G. 1998. Reference to kinds across languages. *NLS* 6. // Cresswell. J. 1976. The semantics of degree. In B. H. Partee (ed.), *Montague Grammar*. New York: Academic Press.// Erlewine, M. Clausal comparison without degree abstraction in Mandarin Chinese. *NL&LT* (To appear). // Grusu, A. & F. Landman. 1998. Strange relatives of the third kind. *NLS* 6. // Kennedy, C. 2009. Modes of Comparison. In M. Elliot et al. (eds.), *Proceedings of CLS 43*. // Li, X. 2015. Degreeless comparatives: the semantics of differential verbal comparatives in Mandarin Chinese. *JoS* 32. // Rett, J. 2014. The polysemy of measurement. *Lingua* 143: 242-266. // Scontras, G. 2017. A new kind of degree. L&P (Online first 02/2017).