Scalarity, degree reading and maximality in a Mandarin numeral construction

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This paper investigates the semantics of an understudied Mandarin numeral construction type, here dubbed *da*-NumPs (i.e. number word < *da* 'big' < noun). Drawing primarily upon evidence from online Mandarin corpora, we argue for a taxonomy of this construction that comprises two distinct interpretations, based on the scalarity of the morpheme *da* and its composition with the other constituents within the construction. Specifically, one reading of *da*-NumPs is a degree superlative reading, in which *da* relates a domain of comparison, denoted by the nominal argument, to a plural group of entities ranked along the upper bound of a contextually determined scale. Second, *da*-NumPs have a definite description reading, in which *da* behaves on a par with a maximality-denoting iota operator, such that the construction refers to the maximal group individual that satisfies the property denoted by the nominal argument. We further show that at the discourse level, both readings encode the way the speaker subjectively construes the situation being described, indicating the speaker's evaluative attitude towards the significance of said situation. This pragmatic condition distinguishes the use of *da*-NumPs against that of alternative, truth-conditionally identical numeral construction types. We further propose that in cases where the nominal component includes a degree argument, a process of degree intensification enables the definite description reading to verify the same situation as is licensed under a superlative semantics. We show that this process provides a way to make sense of the systematic ambiguity available to *da*-NumPs, and allows us to capture its polysemy.

Keywords: *da*-NumPs, superlatives, scalar semantics, definiteness, Chinese

1. Introduction

This paper presents a semantic analysis of the Mandarin Chinese numeral phrase construction that involves the following linear sequence.

(1) [Num < *da* < N]

In this construction, the morpheme *da* 'big' is preceded by a number word and is followed by a bare noun. Throughout this paper, we name the construction type instantiated by (1) *da*-NumPs.

Both behaviorally and semantically, the *da*-NumP construction distinguishes itself from a regular numeral phrase construction where a classifier intervenes between the numeral and the nominal component. We leave a treatment of *da*-NumPs' syntactic behaviors to future research. The present study focuses on the range of synchronic senses expressed by *da*-NumPs. Specifically, we propose that *da*-NumPs are polysemous between two senses. First, a *da*-NumP has a superlative use, referring to the top $[\![Num]\!]$ entities out of the entities within the extension of N that are restricted by a comparison class, defined on a contextually-determined scale. Second, the morpheme *da* functions as a definiteness operator, and a *da*-NumP refers to the unique plurality consisting of the maximal individual within the extension of N. Furthermore, in both uses the utterance of *da*-NumPs is subject to a pragmatic (discourse-level) felicity condition, indicating the speaker's evaluative attitude towards the significance of the situation being described. Through the choice of this particular construction type, the speaker signals that said situation is important and deserves attention.

To date *da*-NumPs have not received a lot of attention in the literature, despite the fact that the construction is productively attested in contemporary Mandarin corpora.[1] A limited number of studies from the synchronic perspective have been conducted in the Mandarin literature (Yang 1999; Li 2003; Li 2004; Xu 2005), among which Yang (1999) is the most detailed as of yet. Yang (1999) provides a three-fold taxonomy of the range of *da*-NumPs' synchronic meanings. According to her, *da*-NumPs first express a prototypical sense of bigness. Second, they also convey derived senses of bigness. Third, in some cases, the bigness meaning is abstracted/bleached to the extent that the *da*-NumP expression refers to all the entities within a situation. Yang additionally notices that a *da*-NumP is commonly used when the speaker considers its referents to be important relative to the current conversational goal, and intends to stress this importance to the other interlocutors. In other words, the linguistic choice of the *da*-NumP expression (as opposed to alternative constructions conveying the same literal meaning) signals that the situation

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1. Several studies before us (e.g. Yang 1999; Chen 2016) have found that *da*-NumPs are not uncommon in Chinese. In addition, based on preliminary corpus search results provided to us by an anonymous reviewer, *da*-NumPs are more productively attested in written sources than colloquial ones. Notably fewer hits of the *da*-NumP expression are found in the conversational corpus CallFriend (Canavan & Zipperlen 1996, size: 0.2 million) than in two written corpora (both of size 1 million), namely The Lancaster Corpus of Mandarin Chinese (LCMC) (McEnery & Xiao 2004) and The 2nd Edition of UCLA Written Chinese Corpus (UCLA 2nd) (Tao & Xiao 2012).

in question deserves attention. This pragmatic effect of *da*-NumPs (referred to by Yang as *da*-NumPs' significance value) is often associated with a naming effect, in which the construction is prone to conventionalization. Yang's observations are highly relevant to us, and will be returned to in our own framework.

Besides, several other works have also investigated the prosody and syntax of *da*-NumPs. Li (2003), for instance, observes that *da*-NumPs favor disyllabic nouns over monosyllabic nouns. It is shown that a vast majority of nouns denote generic, abstract classes, and the referents picked out by *da*-NumPs are the most proto-typical and important elements of these classes. Li (2004) and Xu (2005) discuss whether *da* is a grammatical element that occupies the syntactic position of clas-sifiers. Finally, Yang (1999), Chen (2016), and Jin & Chen (2018) also investigated *da*-NumPs from the diachronic perspective, which we shall return to later in this paper where they are relevant.

While keeping structural discussions to a minimum, the present study makes an empirical contribution by presenting the first truth-conditional analysis of *da*-NumPs' synchronic meaning. In our analysis, instances of *da*-NumPs are structured into a scalar meaning (a superlative semantics) and a non-scalar mean-ing (a definite semantics). Yang's (1999) taxonomy is subsumed under our novel proposal. Our superlative semantics involves a superlative *-est* operator taking as argument a gradable *big*-predicate, thus encompassing both the prototypical sense and the derived senses of bigness according to Yang. Second, Yang's fully bleached cases are instances of a maximality-denoting definite phrase, thereby accounting for the observation that *da*-NumPs may refer to all the entities within a situation. Moreover, the significance value pointed out by Yang is formulated as a pragmatic felicity condition, by which the utterance of the *da*-NumP construction encodes the speaker's evaluation of the situation as important for communicative purposes.

Theoretically, we show that the gradable semantics and the definiteness com-ponent within the *da*-NumP provide a way into understanding how its two uses are related. Specifically, the combination of an implicit definite component and a gradable predicate denoting bigness triggers a superlative inference. Moreover, the standard of comparison inherent in the scalar semantics of the gradable predicate may be manipulated to yield a maximal reference, leading to a definite inference.

The rest of this paper is structured as follows: Section 2 presents motiva-tion that *da*-NumPs have two distinct uses. Section 3 sketches a tentative formal characterization of the semantics of the distinct uses, and hypothesizes possible semantic underpinnings for their relation as well as processes of development. Section 4 concludes the paper. The data employed in the following are partly taken from the internet and partly through elicitation. The sources of data (elicited or internet-based) are acknowledged where they occur. Each internet-based exam-ple comes with its hyperlink. Elicited examples are taken from five native Beijing

Mandarin speakers (three females and two males in their twenties).[2] All examples are obtained during interviews in a group setting, in which we first locate the consultants within a scenario through a description of context, and then present them with utterances relative to that scenario. The utterances provided in the text have been judged as natural in relation to said scenario by all consultants. Throughout the paper, we adopt the notation of # instead of the asterisk (*) to indicate that unacceptability may be due to either syntactic or semantic/pragmatic factors.

2.   A taxonomy of meanings

2.1   Plural degree superlatives

This subsection argues that *da*-NumPs receive a superlative phrase interpretation. Specifically, it means that given a strict (possibly partial) ordering over a comparison class based on a contextually-determined scale, a *da*-NumP locates the top entities at the upper bound of that scale. Four diagnostics are given below in support of *da*-NumPs' superlative reading. A subset of these diagnostics take their ideas from the tests developed in previous works (e.g. Jin & Chen 2018) to diagnose the superlative meaning in historical Chinese. First, a superlative reading is seen most clearly when a strict ordering is made explicit via an ongoing ranking process. This is the case with the examples in (2), taken from internet.

(2) a. *Beijing dangdai   shi da jianzhu   pingxuan jieguo jiexiao.*
         Beijing contemporary ten **DA** architecture voting   result reveal.
         An   depiao shu   cong gao dao di,   shi shoudu jichang
         according.to ballot count from high till low, COP capital airport
         san   hao   hangzhanlou, …, guojia   tiyuguan.
         three number terminal,   …, National   Stadium.
         'The voting results of contemporary Beijing's top ten architectures have been revealed. Based on ballot counts, (the winners) are, in descending order, Terminal 3 of Beijing Capital Airport, …, and the National Stadium.'
                    (http://8bur.cscec.com/xwzx18/jtxw18/201801/2865590.html)
     b. *Huifeng de   mubiao shi yao zai yazhou jishen   san   da*
         HSBC   REL goal   COP   at Asia   move.in three **DA**
         tou-hang   zhi lie,   zai ouzhou ji   ru 5–7 ming, zai
         investment-bank POSS rank, at   Europe squeeze into 5–7 place at

bei-mei   ze   yao   jinru 10-qiang.
North-America instead want.to enter 10-top.
'The goal of HSBC is to move into the group of top three investment banks in Asia, to squeeze its way into the top five to seven place in Europe, and to enter the ranks of top ten in North America.'
<div align="right">(http://bbs.pinggu.org/thread-28895-1-1.html)</div>

c.   *Dan ruguo shuo jingdong yao   pai jin   san   da jutou de*
yet   if   say   JD.com want.to rank inside three **DA** giant POSS
zuoci   limian, cong muqian jingdong de   tiliang he   guzhi
ranking in,   from current JD.com POSS size   and valuation
laishuo, nandu   bijiao   da.
said,   difficulty.level relatively big.
'However, if the JD.com Corporation wants to be ranked among the top three giants, based on the current size and valuation of JD.com, it would be rather difficult.' (http://finance.sina.com.cn/roll/20140219/233518269729.shtml)

Moreover, with a strict ordering, it has to be decidable that one member within the comparison class is ranked higher or lower relative to others (Heim 1995). It follows that if a *da*-NumP indeed expresses a superlative meaning, we should often find contexts where an internal ranking among the top-ranked entities is involved. This prediction is readily borne out. In (3), the referents picked out by the *da*-NumP are further ordered relative to one another, such that there exists a number one among the top four/five (again from internet).

(3)   a.   *Gudai   si   da gongcheng, daodi   shei cai shi diyi?*
ancient.time four **DA** project,   on.earth who PRT COP number.one?
Changcheng?   Dayunhe?   Haishi Dujiangyan!?
The.Great.Wall? The.Grand.Canal or   Dujiangyan!?
'The top four projects of the ancient time, which one on earth is the number one? The Great Wall? The Grand Canal? Or rather the Dujiangyan Irrigation System!?'   (http://www.360doc.com/content/16/
<div align="right">0430/14/32349129_555137094.shtml)</div>

b.   *Meiguo tiyuhuabao   pingxuan-le shishang wu da*
USA   Sports.Illustrated vote-PRF   history   five **DA**
gaozhongsheng   qiuyuan, meiyouyiwai zhanmusi minglie
high.school.student player,   unsurprisingly James   listed.as
bangshou. Pai zai zhihou   de fenbie   shi kebi, jianeite,
top.of.list rank at   following REL respectively COP Kobe, Garnett,
huohuade he   maidi.
Howard   and McGrady.
'*The Sports Illustrated* of the USA voted for the top five high school basketball players of all time. Unsurprisingly, James was ranked the first, followed by Kobe, Garnett, Howard and McGrady in that order.'
<div align="right">(https://isports.ifeng.com/49680484/news.shtml?&back)</div>

Third, since a ranking process is relative to the comparison class, *da*-NumPs are expected to be sensitive, truth-conditionally, to the widening and narrowing of the domain of comparison. This is evidenced in Examples (4a) and (4b), courtesy of a native Mandarin speaker.

(4) a. (*Zai xianggang*) *san   da xiaoshuojia liangyusheng bu   gouge,*
        (in Hong Kong) three **DA** novelist   liangyusheng NEG qualify,
        san   da wuxia   xiaoshuojia hai chabuduo.
        three **DA** kungfu.novel novelist   PRT not.far.away
        '(In Hong Kong) Liang Yusheng wouldn't qualify for the top three *novel writers*. It would probably not be far-fetched for him to be among the top three *kungfu novel writers*.'
    b. #(*Zai xianggang*) *san   da wuxia   xiaoshuojia liangyusheng*
        (in Hong Kong) three **DA** kungfu.novel novelist   liangyusheng
        bu   gouge, san   da xiaoshuojia hai chabuduo.
        NEG qualify, three **DA** novelist   PRT not.far.away
        Intended: #'(In Hong Kong) Liang Yusheng wouldn't qualify for the top three *kungfu novel writers*. It would probably not be far-fetched for him to be among the top three *novel writers*.'

As (4a) illustrates, an individual may fall outside the *da*-NumP [Num *da* N_1], yet still fall within the extension of another *da*-NumP [Num *da* N_2], where the domain denoted by N_2 is a proper subset of that of N_1 ($N_2 \subseteq N_1$). In this particular context, the set of kungfu novel writers is a proper subset of the set of all novel writers. Under a superlative reading, it is plausible that a member of a certain domain is not ranked the top three based on a strict ordering, but nevertheless is ranked the top three after the domain is further restricted. Thus one may truthfully state that one particular kungfu novel writer (in this case, Liang Yusheng) does not belong to *san da xiaoshuojia* 'the top three novel writers', but is part of *san da wuxia xiaoshuojia* 'the top three kungfu novel writers'. On the contrary, there is no way to truthfully utter (4b): given an individual that is evaluated as a kungfu novel writer and yet is not ranked among the top three, it would not be possible for said individual to be ranked higher when the domain is widened. Thus, we would arrive at a contradiction to say that Liang Yusheng is not a top three kungfu novel writer, but qualifies for a top three novel writer (of all genres).

Finally, another piece of evidence compatible with a superlative interpretation involves disputes among conversational partners over memberships within the referents of a *da*-NumP. We assume that at-issue assertion represents the speaker's proposal for updating an informative content to the common ground of both interlocutors (Farkas & Bruce 2010). That is, the assertion of a superlative phrase amounts to a proposal for a particular strict ordering to be updated. This entails

a two-way response on the part of the hearer. The hearer's (sometimes tacit) acceptance results in a successful update of the strict ordering under negotiation, manifested as the mutual acceptance of who the top individuals are. Contrarily, the hearer may reject the proposed ordering and hence disagree over the memberships of the top individuals. Example (5) illustrates the hearer's objection to a strict ordering previously proposed.[3]

(5)   [Context: The NBA center Joel Embiid did not make it to the All-NBA teams of 2018, a basketball fan mocks the decision with the following post]
Dadi   yijing shi dongbu   diyi   zhongfeng le   ba,
the.Emperor already be East.Conference number.one center   PRF SFP,
zhe dou jin   bu liao san   da zhongfeng ma?
this even enter not PRF three **DA** center   SFP?
'"The Emperor" (nickname for Joel Embiid) is already the number one center in the Eastern Conference, right? Even this cannot get him into the top three centers (in the league), seriously?'

(https://m.hupu.com/bbs/21829983-2.html)

The above diagnostics point to *da*-NumPs as encoding a superlative meaning. Nevertheless, this construction differs from the canonical *zui* 'most'-superlatives in important aspects. First of all, the use of the *da*-NumP construction carries the connotation that the situation involved is of significance. Drawing upon Su (2017), we capture this connotation by proposing that *da*-NumPs place the relevant situation under a "significance lens". Su (2017) takes up the Cognitive Grammar notion of construal (Langacker 2007; Verhagen 2007), which pertains to the way the speaker conceptualizes the situation under description. Given the same situation, the choices between alternating linguistic constructions are dependent upon the linguistic construals being encoded. Su proposes to add a new construal, termed "lens", to the ontology of construals. Relevant to our purpose is what Su terms the significance lens, which expresses a speaker's evaluative attitude towards an event, marking the event as having major worth and thus deserving of attention. Notably,

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3.   A caveat is needed here, since disagreement between the hearer and the speaker may arise when the hearer objects to 'the top Num' as a distinct class on its own. That is, the hearer may not recognize the top Num entities as a relevant group worthy of establishing a recognized class relative to some conversational goal, even if the hearer does not object to which entities, in effect, are ranked the top Num under a strict ordering. For our purpose here, we want to point out that the well-recognized status of a 'top three' class is not in doubt among the interlocutors in Example (5). The context in (5) is best understood as involving disagreement over particular rankings (which individuals should be the top three), with all interlocutors implicitly agreeing on the validity of a distinct 'top three' class, namely memberships within the three All-NBA teams. We thank an anonymous reviewer for raising this issue to us.

no matter whether the situation is significant in an objective sense or not, linguistic devices for the "significance" lens can present the situation (or the object) as being significant. Against this background, we suggest that *da*-NumPs are one such linguistic device. The use of *da*-NumPs, contrary to other alternating constructions, signals the speaker's evaluative attitude towards the situation as having notable worth relative to the communicative goal and directs attention to said situation.[4]

To illustrate, the following elicited utterance in (6) is odd within the immediate surrounding discourse, since under a natural construal the situation about the top four grades do not lie at the center of attention. The relevance of good grades is subordinate to a narrative structure in which the speaker directs attention to little Zhang's unusual choice of school, whereas the particular ranking (the fact that her grades are among the top four, not the top six or eight, etc.) does not deserve attention according to the speaker's intention. In such a case, a neutral superlative construction *qian si-ming* 'the top four' or *zui gao de si-ming* 'the highest four' is preferred, as it does not indicate the speaker's evaluation of the situation of the top four ranking as significant for the conversational discourse.[5]

(6) ?*Xiao zhang kaode   henhao, ta   de   fenshu haoxiang shuyu   ban li*
little Zhang take.test well,   she POSS grades probably belong.to class in
de   si   da. Danshi ta   meiyou qu shi li de   ming xiao,   ershi
POSS four **DA**. Yet   she did.not go city in POSS good school, rather
xuanze liu   zai ben xiao   du   gaozhong,   yinwei ta dui
choose stay at   alma.mater pursue high.school, because she toward
benxiao   tongxue gen laoshi   you ganqing.
alma.mater classmates and teachers have affection
'Little Zhang did well in the exam. Her grades are probably among the four highest in her class. Yet she did not go to those good schools in her city, and rather opted to continue high school in her alma mater, as she had developed a deep affection towards her classmates and teachers there.'

Another characteristic of *da*-NumPs involves predicate uses. As (7a) demonstrates, the superlative phrase containing the operator *zui* 'most' has a predicative use. In contrast, the *da*-NumP in (7b) fails to be used predicatively (both examples are elicited). Notably, the predicative *zui*-phrase in (7a) is no longer felicitous if it carries a numeral component (i.e. when *san-ge* 'three-CLF' is added, 7a cannot mean Shanghai, Beijing, and Guangzhou are the three biggest). Hence the restriction

against the *da*-NumP's predicative use is explained away as a byproduct of its sub-categorization for numerals.[6]

(7) a. *Shanghai, Beijing he   Guangzhou (#san-ge)   zui-da.*
         Shanghai, Beijing and Guangzhou (#three-CLF) SUP-big.
         'Shanghai, Beijing and Guangzhou are the biggest.'
     b. #*Shanghai, Beijing he   Guangzhou san   da.*
         Shanghai, Beijing and Guangzhou three **DA**.
         Intended: 'Shanghai, Beijing and Guangzhou are the three biggest.'

A third distinction between *da* and *zui* pertains to how the gradable property (that is part of the superlative's semantics) is expressed. Whereas *zui* takes an overt gradable adjectival argument, as is the case with English *-est* (cf. Aihara 2009), an overt adjective cannot co-occur with *da*. While a scale along the dimension of fame/skillfulness is implicit in the *da*-NumP expression of (8a), its overt expression is ruled out. Conversely, it is not possible to force a degree reading for *zui* in the absence of an adjective and meanwhile retrieve the implicit adjective from context. This is exemplified in (8b).

(8) a. *Ta shuyu   zhongguo de san   da (#{chuming/jishuhao}) houwei.*
         he belong.to China   REL three **DA** (#{famous/skilled})   guard
         'He belongs to one of China's three most famous/skilled guards.'
     b. *Ta shuyu   zhongguo de san-ge   zui* #*({chuming/jishuhao})*
         he belong.to China   REL three-CLF -st #({famous/skilled})
         de   houwei.
         REL guard
         'He belongs to one of China's three most famous/skilled guards.'

Moreover, unlike *zui*-superlatives, superlative *da*-NumPs do not give rise to a par-ticular kind of domain restriction, referred to in the literature as the 'comparative' reading of degree superlatives (Heim 1995; Farkas & E Kiss 2000; Heim 2015). In keeping with von Fintel's (1994) implementation of context dependency, we posit that the semantics of superlative operators comes with a hidden context variable that restricts the possible comparison set (see Heim 1995). The 'comparative' read-ing comes from a particular valuing of the context variable. Thus, *Sue climbed the tall-est mountains* gives rise to a comparative reading when the comparison class of

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6. In Chinese, adjectival and verbal predicates occur without copulas, contrary to nouns (Tai 1982; Paul 2010). We observe that (7b) would become acceptable when a copula is inserted to the left of *san da* 'three DA'. However, with the presence of a copula, the post-copula complement becomes a nominal predicate, and (7b) is turned into a predicational copular clause. In that case, the expression *san da* 'three DA' is analyzed as taking an elided NP, hence irrelevant to our discussion.

mountains is relative to the relevant climbers (alternative climbers to Sue in context). Alternatively, the mountains that Sue climbed could be the tallest amongst a comparison class of mountains that is contextually relevant, with no reference to other climbers. This alternative reading obtains when the value of the context variable happens to be a set of contextually relevant mountains. In this way, contextual ambiguity during domain restriction leads to the ambiguity of superlative sentences.

As (9a–b) show, superlative *da*-NumPs pattern with *zui*-superlatives in allowing for the set of mountains to be restricted to those that are contextually relevant. This reading can be made explicit via an overt domain restriction device, such as an optional possessor phrase.

(9) [Context: Little Zhang, Little Li and Little Wang went to climb mountains.]

   a. *Xiao zhang qu niboer pashan, deng shang le (niboer jingnei) liang*
      little Zhang go Nepal climb,   climb up   PRF (Nepal territory) two
      da xueshan   zhiyi de X shan.
      DA snow.mountain one.of POSS X Mt.
      Intended reading: 'Little Zhang went to Nepal to climb mountains, and he climbed atop one of the two tallest snow mountains (out of all the snow mountains in the Nepalese territory), Mt. X.'

   b. *Xiao zhang qu niboer pashan, deng shang le (niboer jingnei) zui*
      little Zhang go Nepal climb,   climb up   PRF (Nepal territory) -est
      gao de liang zuo xueshan   zhiyi de X shan.
      tall POSS two CLF snow.mountain one.of POSS X Mt.
      Intended reading: 'Little Zhang went to Nepal to climb mountains, and he climbed atop one of the two tallest snow mountains (out of all the snow mountains in the Nepalese territory), Mt. X.'

Conversely, in (10), the set of mountains is overtly restricted to those that are climbed by the three individuals little Zhang, Little Li, and Little Wang. This 'comparative' reading is available only to *zui*-superlatives, and not to *da*-NumPs. (10b) is unacceptable, in contrast to the *zui*-superlative in (10a). That is, in (10b), the two mountains cannot be understood as simply the tallest when relativized to those mountains climbed by the other individuals.

(10) [Context: Little Zhang, Little Li and Little Wang went to climb mountains.]

   a. *Xiao Zhang pa de xueshan   shi tamen jige limian zui*
      little Zhang climb POSS snow.mountain COP they a.few in   SUP
      gao de liang-zuo.
      tall REL two-CLF
      Intended reading: 'The snow mountains that little Zhang climbed are the tallest two (among the snow mountains climbed) by the three of them.'

b. #*Xiao Zhang pa   de   xueshan   shi tamen jige   limian*
little Zhang climb POSS snow.mountain COP they   several in
de   liang da.
POSS two   **DA**
Intended reading: 'The snow mountains that little Zhang climbed are the tallest two (among the snow mountains climbed) by the three of them.'

Based on the above contrast, we tentatively conclude that *da*-NumPs disallow the kind of context valuing that gives rise to a comparison set defined on alternative climbers, hence the unavailability of a 'comparative' reading.[7] Given that *da* never combines with an overt gradable adjective argument, and its scalar semantics ranges over all the dimensions that the adjective *big* may express, we suggest that the morpheme *da* in its superlative use lexically encodes two meaning components: the superlative operator as well as its associate gradable adjective argument. *Da* thus means 'great-est, bigg-est', except that it is not morphologically decomposable.[8]

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7.   Note that in the above examples, we have chosen disyllabic nouns such as *xueshan* 'snow mountains' as nominal parts of *da*-NumP expressions, instead of just using *shan* 'mountain'. This is for prosodic reasons. As an anonymous reviewer has pointed out to us (this observation dates back to at least Li 2003), in *da*-NumPs monosyllabic nouns are less acceptable compared to disyllabic nouns (e.g. *san da shan* 'the top three mountains' is slightly degraded).

8.   This paper has not looked into the possibility of an alternative, pragmatic analysis of the superlative reading of *da*-NumPs (suggested to us by an anonymous reviewer). According to such an analysis, the morpheme *da* just means 'big'. 'The big four schools' generates a superlative inference, guaranteed by the uniqueness definition of definite descriptions. The distinction between a truth-conditional approach and a pragmatic approach is hard to pin down, and we hope to pursue this distinction further in later research, preferably with experimental investigations and also with a comparison of *da*-NumPs with the English 'Big N' construction.
     In what follows, we note in passing two observations that appear to us to be compatible with a truth-conditional characterization. First, with a 'big' meaning for the morpheme *da*, the definite meaning component in Chinese *da*-NumP expressions such as 'the big four schools' would have to be encoded covertly. This by itself poses no problem at all, as it has been widely assumed that numeral phrases in Chinese could carry a null definiteness operator (cf. Simpson et al. 2011; Cheng et al. 2017). Importantly, though, when there is no overt marking Chinese numeral phrases are ambiguous between a definite reading and an indefinite one (as in 'there are *four big schools* in the district'), depending on context. *Da*-NumPs, in contrast, cannot give rise to an indefinite interpretation, and are incompatible with contexts inducing a non-definite reading. In our treatment, this is accounted for, since superlative semantics obligatorily carries a definite component (we further assume later that in the definite use of *da*-NumPs, definiteness is overtly encoded by the morpheme *da*).
     A second issue is that a superlative expression does not imply uniqueness, which differs it from a regular definite description (cf. Stateva 2002; Fitzgibbons et al. 2008). Imagine a set of ten schools in context. A definite NP *the schools* must refer to the maximal group of individuals, that

This dual component characterization also potentially offers a way to account for the absence of the 'comparative' reading. Several semantic proposals (dubbed the DP-external theory or the movement theory) hold that the comparative reading of superlatives is derived via the movement of the superlative operator out of the DP it originates from (Szabolcsi 1986; Heim 1995; Aihara 2009). In *Little Zhang climbed the tallest mountains*, the superlative operator *-est* merges within the DP *the tallest mountains* but then takes a DP-external scope and composes with a contextual variable that ranges over alternative individuals to Little Zhang. The truth condition would then state that there exists a height climbed by Little Zhang, but not the other individuals within the contextual variable. If the movement solution to the comparative reading carries over to Mandarin, it might be argued that superlative operator movement is an option for Mandarin *zui*, but not available for *da*, since *da*'s superlative operator component always stays with the gradable adjective and does not leave the latter stranded in the *in situ* scope. However, we would like to leave a detailed treatment to future work, as much research is required to determine whether movement is a viable option in Mandarin superlatives.[9]

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is, the plurality of ten schools. On the other hand, we could say *the top two schools*, *the top three schools*, etc. within the same context. The number of schools appropriately included as being the top is negotiated by the speaker and the hearer relative to their conversational goal. Interestingly, the superlative use of *da*-NumPs behaves on a par with other superlative phrases, demonstrated by the following spontaneous utterance:

(i) [Context: there are already many good international basketball players in the NBA, hence a discussion about whether a Team World made up of international players could beat Team USA]

Liang ge   dui   tiao chu tamen de   san   da   huozhe si   da   huozhe wu
two   CLF team pick out they POSS three **DA** or   four **DA** or   five
da   qiuxing qu dantiao,   nei   ge   dui   ying wo bu zhidao. Da   bisai
DA star   to one.on.one, which CLF team   win I   not know. Play game
shi shi'er ge   ren   yidui.   Ni yaoshi ge   tiao chu tamen de   shier
COP twelve CLF person one.team, you if   each pick out they POSS twelve
da   qiuxing lai da, haishi cha   hen   yuan de.
DA star   to play, stil   fall.short quite far   PRT
'If each team (Team USA and Team World) picks out their top three, top four or top five stars and does one-on- one solo, I am not sure which team would win. (But) it takes twelve players to form a team in games. So if you are gonna pick out the top twelve players from each team, Team World would still fall far behind Team USA.'

Note again the above observations do not argue against an alternative analysis. We are simply claiming that these two issues are both compatible with a semantic approach. How they are accommodated under a pragmatic approach, and what are the relative merits of either approach, await future research.

9. The analysis of *da* (with its scalar *big* component) as including a slot for the degree argument also captures the restraint where *da*-NumPs resist a quantity reading (e.g. *John has the most*

In sum, this subsection proposes a superlative use of *da*-NumPs in the sense of Heim (1995). Much of the descriptive work is given over to motivating the existence of a ranking process, based on a partial strict ordering along a contextually-determined dimension. Contexts are identified that involve certain individuals ranked in top positions, relative orderings within top-ranked individuals as well as controversies over which ordering is valid. The account also compares the distribution of *da*-NumPs with that of other superlative expressions, and takes up the idea that the *da*-NumP expression is a linguistic device for the speaker's subjective evaluation of the significance construal.

2.2   Definite description

We believe that *da*-NumPs are polysemous between a superlative interpretation and a definite description interpretation. A superlative phrase also carries a definiteness component (Krasikova 2012; Coppock & Josefson 2015). Without going into the complications of different notions of definiteness, we focus on another distinction between a superlative and a definite phrase that involves the presence of a ranking component: unlike superlatives, pure/non-scalar definites presuppose maximality but not a ranking process. This means a ranking base (comparison class) is absent from context, from which a subset of top-ranked entities are picked out. The examples in (11), taken from internet, are instantiations of the definite description use:

(11)   a.   [Context: Team Italy was crushed out of the 2018 Russia World Cup. Three veterans in the current team, including Gianluigi Buffon, were part of the 2006 World Cup Champions squad]
Bufeng liuzhe lei   queren tuichu yidali, san   da guanjun   laochen
Buffon shed tears confirm quit   Italy,   three **DA** champions veteran
jiti   gaobie.
together bid.farewell
'Buffon, in tears, confirmed he will quit Team Italy, and thus the three former champions veterans have collectively bid farewell.'
(http://sports.sina.com.cn/g/seriea/2017-11-14/doc-ifynstfh7782544.shtml)

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books), and only license a degree reading. A quantity superlative requires that the superlative operator takes a covert amount argument. Therefore, in a *da*-NumP the quantity reading will be ruled out as the amount argument competes for the same slot with the degree argument. Additionally, nevertheless, the absence of a quantity reading could be equally derived from the fact that *da*-NumPs obligatorily combine with a cardinal number. Quantity superlatives refer to a maximal amount/quantity, which is not compatible with words denoting a particular cardinality. For instance, the following English expression is also off:

(i)   *the four most books…

b.   [Context: Melbourne has altogether three PTE (Pearson test of English) test centers, located on the Collin Street, the LaTrobe Street and the Bourke Street, respectively]

Jintian wei dajia shenru   fenxi   jieshao   moerben   PTE san   da
today   for you   in-depth analyze introduce Melbourne PTE three **DA**
kaochang de   quanmian   xinxi.
test.center POSS comprehensive information
'Today, (we) will introduce and analyze for you the comprehensive information about the three PTE test centers in Melbourne in an in-depth way.'
(http://au.wesousou.com/index.php?m=promotion&a=show&id=9330)

The above examples are uttered in contexts that notably lack a larger domain of comparison class. In (11a), the reference of *guanjun laochen* 'champion veterans' comprises three players, since world knowledge/contextual information is such that altogether three players are former champions. Similarly, there are three Melbourne PTE test centers *in toto* (cf. 11b). In each case, *da*-NumPs fit in well with standard semantic characterizations of definite descriptions as encoding informational maximality (Sharvy 1980; Link 1983; von Fintel et al. 2014; Heim 2015): their reference anchors the maximal group of objects relative to the local situation.[10]

Further evidence can be evinced to make a distinction between a superlative reading and a definite reading. In the previous subsection, we have shown that a superlative property does not hold under a widened comparison class: the top $[\![Num]\!]$ entities among a domain N_1 based on a contextually determined scale are not necessarily ranked the top on a bigger domain N_2 (for $N_2 \supseteq N_1$). In the case of a definite reading, the property associated with either of the domains may anchor the same referents, as long as contextual maximality is met. Thus, in Example (12) below, a naturally-occurring transcription of a TV ad, the unique maximal plurality consisting of Nivea, Mentholatum, Gillette, and Watercome is referred to as *the four men's brands* in the first sentence below, and subsequently referred to as *the four brands* in the second sentence.

(12)   *Xiaoqu   mendian tuichu si   da nanshi pinpai niweiya, manxiuleidun,*
Watson's   store   present four **DA** men   brand Nivea,   Mentholatum,
jilie,   shuizhikou di'er   jian 5 zhe.   Si   da pinpai zhu nanshi
Gillette, Watercome second CLF 5 discount. Four **DA** brand help men

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10. Yang (1999) is to our knowledge the first to diagnose the definite use of *da*-NumPs in terms of the maximal reference of definite descriptions. See also Chen (2016) and Jin & Chen (2018), which apply a similar test in historical Chinese.

> *zuo hao xingxiang guanli.*
> do well image   management
> 'Watson's stores have rolled out 50% promotions for the four men's brands of Nivea, Mentholatum, Gillette, and Watercome. The four brands help men with better image management.'

Moreover, based on our consultation, the utterance in (12) cannot be followed up by a reply disputing the membership of the four brands, as (13) illustrates.

(13) #*Shuizhikou bu   shuyu   si   da pinpai.*
     Watercome NEG belong.to four **DA** brand
     Intended: 'Watercome does not belong to the top four brands.'

The infelicity of the above reply is unexpected if the *da*-NumP expression in (12) refers to the top four brands. In the previous subsection, we assume that at-issue assertions are proposals to update the common ground (Farkas & Bruce 2010): in asserting a superlative property predicated of some entity, the speaker proposes a strict ordering for negotiation with the other interlocutor, which is subject to either acceptance or rejection by the latter. If the proposed strict ordering is accepted, it will be updated to the common ground. Conversely, the hearer could use (13) as a natural response to indicate rejection (and counterproposal to reorder the ranking of brands) if she disagrees with the proposed strict ordering. In other words, the infelicity of (13) would be mysterious if the *da*-NumP expression in (12) is interpreted superlatively. On the other hand, if *si da pinpai* 'four DA brand' in (12) expresses a definite reading, the incongruity of (13) as a reply is readily accounted for: the *da*-NumP would simply refer to all the brands salient from local context. Information regarding contextual salience is generally assumed to be part of common ground, instead of what gets updated during the assertion of at-issue contents. Hence, it is not subject to speaker-hearer negotiation to a similar extent.

    Finally, the example in (14) shows that the *da*-NumP expression may serve as an (intersentential) anaphor to a free choice item antecedent (Vendler 1967). This pattern is again compatible with a definite reading but incongruous with a superlative reading. In (14)'s first sentence, the indefinite free choice expression *xiamian tiaojian zhong de renyi san-ge* 'any three of the following conditions' represents a variable that is contextually determined (Kadmon & Landman 1993; Giannakidou 2001). Importantly, the free choice item triggers an ignorance condition (Dayal 1997), such that the value of these three conditions is unknown according to the epistemic state of the speaker and varies by situation: as it is stated that any three conditions out of a larger pool of conditions meet the qualifications for franchising, it follows that each applicant may present a different set consisting of three conditions during application. While this poses no problem for the use of a definite description

that is situation-specific, it is incompatible with a superlative reading. The latter must anchor the top three conditions relative to a scale. Its reference thus remains invariant across applicants, and cannot be anaphoric to a free choice antecedent.

(14) *Jiaru xiaoqu   mendian bixu manzu xiamian tiaojian zhong de   renyi*
join Watson's store   must satisfy following condition in   POSS any
san-ge   …Shenqingzhe xu   tigong   zhengming manzu san   da
three-CLF …applicant   need provide prove   satisfy three **DA**
tiaojian de   shumian wenjian.
condition REL written   document
'To join Watson's as a franchise, you must satisfy any three of the following conditions.…Applicants who meet such criteria are required to present proof that they meet the three conditions (of their pick).'

We argue that, as in superlative *da*-NumPs, definite *da*-NumPs similarly perform the discourse function of placing the relevant situation under the 'significance' lens (Su 2017). Take (14) for illustration. The *da*-NumP expression *san da tiaojian* 'three DA condition' is interchangeable with a corresponding regular numeral construction *san-ge tiaojian* 'three CLF condition' without compromising acceptability (in a regular numeral construction, a classifier obligatorily intervenes between the numeral and the nominal, cf. Tai 1994). The particular choice of the *da*-NumP expression (over alternative numeral phrases) serves to indicate that the situation in which these three conditions occur is noteworthy from the speaker's point of view. Thus, its utterance directs the hearer's attention to the three conditions such that the hearer is reminded of the notable worth of said objects. In (14)'s discourse, the utterance of the *da*-NumP invites a potential applicant's attention to the three conditions, signaling the speaker's emphasis on the central role these conditions play in the application procedure. If changed into the alternative [numeral classifier] construction, the importance attached by the speaker to the application procedure is no longer salient. A similar attention-seeking discourse function is performed via the utterance of the *da*-NumP *si da pinpai* 'the four brands' in Example (12). Once again, this expression alternates with (not meaning-changing) a corresponding numeral phrase with classifier, *si ge pinpai* 'four CLF brand'. The particular choice of the *da*-NumP expression alone conveys the speaker's undertone that readers should remember these brands by their names and see to it that they buy them when visiting the store.

The current discussion has all along assumed semantic transparency. We note in passing that once a *da*-NumP expression is coined, its tendency to be employed for construing significance lends itself to conventionalization. The following example demonstrates that *da*-NumPs also serve as rigid designators (Kripke 1980), i.e. their references do not vary from context to context. Although the expression in (15) originated as a definite description, nowadays the descriptive content that

is explicitly seen from its form appears to retain only an 'etymological meaning' (Kneale 1962; Carlson 2015), reflecting the initial naming process. For many native speakers, the reference of the expression in (15) is fixed. It always denotes the following four ancient Chinese inventions: compass, gunpowder, papermaking, and movable type printing.

(15)   *Si   da faming*
      four **DA** invention
      'The Four Inventions'

As naming acts warrant the length of a separate paper, the present study will abstract away from the distinction between those *da*-NumPs that are created on the fly, and those that have a conventional use.

    In the previous subsection and this subsection, we have shown that the superlative use and the definite use coexist in *da*-NumPs. These two readings may be teased apart, depending upon whether *da*-NumPs take a possessor phrase (this observation is due to Jin & Chen 2018). Possessor phrases function to overtly restrict the domain of ranking (comparison class) for *da*-NumPs. It thus follows that the presence of a possessor phrase favors a superlative reading of *da*-NumPs over a definite reading, corroborated by the following contrast:

(16)   a.   *Si   da ming   xiao*
          four **DA** famous school
          'the four famous schools'
     b.   *Guangzhou si   da ming   xiao*
          Guangzhou four **DA** famous school
          'the top four famous schools of Guangzhou'

Example (16a) is ambiguous between a superlative and a definite interpretation. (16b), on the other hand, only refers to the top four prestigious schools in the city of Guangzhou.

    To sum up, § 2.2 introduces a preliminary treatment of *da*-NumPs as definite descriptions. The definite use shares with the superlative use the discourse function of encoding the significance lens. The difference with the superlative expression lies in that definites lack a meaning component for comparison. Drawing on classic and recent accounts of definite descriptions, we suggest that a context-dependent maximal reading can be diagnosed. For instance, the definite use of *da*-NumPs is not sensitive to domain widening or narrowing as long as the maximal plurality in context remains the same, contrary to the superlative use. Furthermore, the definite use no longer allows dispute over ranks, and allows anaphoricity to free choice antecedents with speaker-ignorant value assignments. It is further proposed that *da*-NumPs could turn into proper names as their use tends to become conventionalized.

3.   Interpreting the meanings

3.1   Formalization

This section demonstrates that the scale structure and the standard value of gradable adjectives are important lexical properties in understanding the multiple meanings of the morpheme *da* and *da*-NumPs' interpretational differences. In the following, we discuss the semantic implementations of *da*-NumPs in their polysemous uses. We then turn to how contexts interact with both the scale structure and the standard value of the *da*-NumP expression in deriving ambiguous readings, which we suggest underlies how *da*-NumPs involved alternation from one use to another.

We first work out the semantic derivation of the superlative *da*-NumP. We assume that a superlative phrase comprises a gradable adjectival argument that carries a scale along a particular dimension, and also a minimal degree (i.e. a cut-off point) such that the top entities are located above that degree on the scale. In terms of the semantics of the gradable (positive) adjective *big*, we follow mainstream literature and analyze gradable predicates as a relation between individuals and degrees (Klein 1980; von Stechow 1984; Rett 2014). The adjective *big* thus denotes a two-place relation between degrees of bigness and objects as follows.

(17) $\llbracket big \rrbracket = \lambda x \lambda d.\ [big\ (x)(d)]$

In *big*'s attributive use (e.g. *big countries*), we follow Heim (1995) in assuming that the gradable adjective undergoes type shifting and takes a nominal predicate as its argument, illustrated in (18):

(18) $\llbracket big \rrbracket = \lambda N \lambda x \lambda d.\ [N(x) \wedge big\ (x)(d)]$

Furthermore, a distinction is needed between unmodified positive adjectival predicates (used in isolation) and modified positive adjectives (e.g. those that combine with such operators as the superlative *-est* or the comparative morpheme *-er*). The distinction has to do with the implicit standard of comparison during evaluation. As various authors have observed, an unmodified positive gradable adjective is interpreted with a 'threshold' degree in mind (von Stechow 1984). In saying that someone is tall, we are committed to meaning that she is tall to a significant degree, not just that she has a certain height (which is a trivial statement). Similarly, *big countries* refers to countries that are big above a context-appropriate degree of bigness. One way to account for this 'threshold' interpretation is to characterize the truth conditions of positive gradable adjectives in terms of a contextually defined standard of comparison. Following Klein (1980) and Rett (2014), we posit that unmodified adjectives contain a null degree morpheme *pos*

(which stands for POSITIVE FORM), the function of which is to relate the degree argument of a positive adjective to an appropriate standard of comparison. Formally, *pos* relates individuals to degrees d above a particular standard s_c that is defined along a dimension. The value of the particular standard is provided from context c. The denotation of *pos* is represented in (19), where degrees form a domain D_d (type d).

(19)   When the gradable adjective R is used attributively, with a modified nominal,
$$[\![pos]\!] = \lambda R_{<e,d,t>} \lambda N_{<e,t>} \lambda x \, \exists d \, [R(x)(d) \wedge N(x) \wedge d > s_c]$$

Unlike an unmodified positive adjectival predicate, the big-relation, modified by the superlative operator, does not carry a covert *pos* component, and hence its degree argument is not related to s_c taken from context c. (20) provides the denotation of the *da*-NumP as a superlative phrase. The gradable component $big_{<d, <e, t>>}$ is defined as long as there exists a degree d such that big (x)(d) obtains given any x in context c. We posit that the morpheme *da* lexically encodes a superlative operator as well as a gradable adjectival component. Note in addition that the superlative phrase further contains a covert context variable C that serves to restrict the comparison class to those relevant individuals (von Fintel 1994).

(20) $[\![NumdaN]\!] = \lambda x \, [C(x) \wedge N(x) \wedge \exists d \, [big(x)(d) \wedge \forall y \, [N(y) \wedge y \neq x] \rightarrow \neg big(y)(d)]$
$\wedge \, |Atoms(x)| = [\![Num]\!]]$

In (20), x ranges over plural entities, where plurality is defined in mereological terms. A plural individual is of type e, on a par with a singular individual. Atoms (x) returns the set of atomic parts of the plurality x (<denotes the relation of proper parthood):

(21)   Atoms (x) = {y: atom (y), i.e. y < x $\wedge \forall z$ [it is not the case that z < y]}.

We assume with Heim (1995) that downward monotonicity applies in degree semantics, formulated as follows.

(22)   A function f in $D_{<e, <d,t>>}$ is downward-monotonic w.r.t. a model that includes a domain of degrees D_d, a domain of individuals D_e and an ordering $\prec$ iff for all x in D_e, and d,d' in D_d, if f(x)(d) = 1 and d' $\prec$ d, then f(x)(d') = 1.

With downward monotonicity in place, it is guaranteed that the denotation in (20) picks out the plurality that is associated with a degree higher than any other individuals. To verify this, let us assume big (x)(d) for x and ¬big (y)(d) for another plurality y. According to (22), if there is a degree d' such that big (y)(d'), then d'<d. In other words, y can only be associated with degrees smaller than d, and cannot

be associated with degrees larger than d. That is, x is higher up than y in terms of a scale defined by bigness.[11]

We now proceed to the definite use. Specifically, we propose that *da* is a definiteness operator. *Da* takes a nominal predicate as input and returns an object of type e with the nominal's property. In keeping with Sharvy (1980), Link (1983), von Fintel et al. (2014) and Heim (2015), we assume that a definite NP has an iota-ized maximal reference, represented in (23).

(23) $[\![DEF\ P]\!]$ (P of type <e,t>) is defined only if there is a unique maximal object x based on an ordering on element of type e, s.t. MAX (P(x)) is true. The reference of $[\![DEF\ P]\!]$ is this unique maximal element. i.e. $[\![DEF\ P]\!] = \iota x.\ [MAX(P(x))]$ (where $\iota x.\ [f(x)]$ is defined if $f(x)$ has one satisfier, and is otherwise undefined); $MAX(P) = \lambda x.[P(x) \wedge \neg\exists y\ [P(y) \wedge x < y]]$ (< is the relation of proper parthood).

Here the standard well-definedness condition of the iota expression guarantees an existential presupposition, such that there must be some object that satisfies the property denoted by MAX(P). Furthermore, the condition rules out cases of multiple satisfiers. In the singular definite case, where the property denoted by MAX(P) refers to singular, atomic objects, the well-definedness condition guarantees that the context contains one unique object with said property. Similarly, given a context-salient set of atomic brands a, b, and c, the plural definite *the brands* denotes the maximal plural element a+b+c, as is guaranteed by the maximality component specified by MAX(P). This plural individual also satisfies the uniqueness condition of the iota operator.

3.2   Superlativeness and invited superlative inference

In this and the following subsection, we present evidence that the uses of *da*-NumPs are interconnected through semantic (and pragmatic) factors. We first highlight the link between a *da*-NumP's gradable component ('big') and its superlative interpretation. Specifically, in *da*-NumPs containing a definite component, the combination of definiteness and gradable semantics invites a superlative inference.

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11. Also relevant to superlativeness is the application of distributivity to pluralities (Sharvit & Stateva 2000). That is, we need to guarantee that if a superlative property holds of a plural individual, then said property holds of every atomic member of that plurality. This is characterized by the presence of a distributive operator *D* on the plurality(Link 1983):

(i) $[\![D]\!] = \lambda P_{<e,t>}.[\lambda X_{<e>} \forall x[x \in X \rightarrow x \in P]]$ where X denotes a plural individual, and x denotes a singular individual.

By incorporating the distributive operator to the superlative construction, we guarantee that a cut-off degree holds of each atomic individual in the top-ranked plurality, but does not hold of any other individual in the domain.

A preliminary survey of historical data lends support to the idea that the superlative meaning developed from a lexical meaning. In corpora prior to Early Mandarin, to the extent that contextual information offers clues to meaning, the sequence of [numeral < *da* < noun] tends to receive a lexical reading. In (24), for example, six grave sins are introduced as novel discourse referents in an existential sentence where the *you* 'have'-sentence introduces an existentially bound indefinite referent (similar to English *there*-existentials) and the numeral *liu* 'six' is used predicatively.[12]

(24) *Bu du fan   ren   nai you da zui liu, bu ke   chu   ye.*
      NEG see mortal person then have **DA** sin six, NEG MOD get.away PRT
      'You fail to see that for a mortal person, there are big sins that are six in number, and these sins one cannot get away from.' (*Taiping Jing* 'The Scripture of Peace', vol. 4.16.103, ca. 2nd to 3rd century AD, translation based on Yang 2013: 26)

The subsequent paragraphs explain what these sins are, and why they are grave sins never to be committed. Toward the end of the same corpus text, the now discoursesfamiliar six grave sins are referred back to by a *da*-NumP expression *liu da zui* 'six DA sins', illustrated in (25). We thus conclude that within this discourse, *da* consistently conveys a 'big' meaning.

(25) *Bu chu   ci   liu da zui, tian e   zhi bu ke   chu   ye.*
      NEG get.rid.of these six **DA** sin, heaven evil OBJ NEG MOD get.rid.of PRT
      'If you don't rid yourself of these six big sins, you won't be able to get rid of the heavenly evil.'   (*Taiping Jing*, vol. 5.5.12, translation based on Yang 2013: 31)

As another illustration, in (26)'s context, the expression *liu da xing* 'six DA star' contrasts with *si xing* 'four star' and *si xiao xing* 'four small star', suggesting that a three-way size (bigness) distinction serves as the means to discern stars in the galaxy. Accordingly, we consider it plausible to analyze *da* as an attributive *big* here.

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12. The historical corpus data cited in this section and the next section are taken from Erudition (Airusheng) China Basic Ancient Books Database http://er07.com/home/pro_3.html, the largest online-based collection of digitized books of pre-modern Chinese (more than 10,000 books, 1.7 billion Chinese characters). Similar observations of the diachronic development of *da*-NumPs can be traced back to Yang (1999), who tracks the historical development of *da*-NumPs, which started out as a fully compositional numeral construction that subsequently underwent constructionalization. Subsequent discussions include Li (2004), Chen (2016) and Jin & Chen (2018). Chen first observes that *da*-NumPs in historical Chinese underwent a successive meaning change from adjectives to superlatives and then to definites, and offers a pragmatic account of the latter grammaticalization process in terms of cognitive pressure and attention span. Jin & Chen present a detailed historical corpus study in support of Chen's (2016) proposed grammaticalization process. The historical examples cited in this and the next section differ from the examples from previous work and are based on our own corpus search, since we have sought to identify the earliest attestations for the superlative and the definite use, something the previous research has fallen short of doing.

(26) *Ku lou shi xing, liu da xing wei ku, nan si   xing wei*
      Ku Lou ten star, six **DA** star COP Ku, south four star COP
      lou…zhongyang si   xiao xing, heng ye.
      Lou…middle   four small star, Heng PRT
      'Ku and Lou have ten stars. The six big stars are Ku, the four stars to the south
      are Lou…In the middle there are four small stars, these are Heng.'
      (*Jin Shu* 'Book of Jin', vol. 11, *Treatises on Astronomy*,
      part I, ca. 648 AD, based on translation by Yu 1999)

We find that a clearly superlative interpretation emerged later. (27) presents an
Early Mandarin example, with the domain-restricting possessor phrase *tianxia* 'all
lands under heaven' inducing a ranking scenario.

(27) *Tianxia   si   da shuyuan, er   zai bei,   er   zai nan, zai bei*
      under.heaven four **DA** academy, two at   north, two at   south. at   north
      zhe   songyang, suiyang ye, zai nan   zhe   yuelu, bailudong ye.
      NMLZ Songyang, Suiyang PRT, at   south NMLZ Yuelu, Bailudong PRT
      'The four greatest academies of all lands, two are located at the north, and two
      are located at the south. The northern two are, respectively, Songyang Academy
      and Suiyang Academy. The southern two are, respectively, Yuelu Academy and
      Bailudong Academy.' (*Wu Wenzheng Ji* 'Collections of Wu Wenzheng', vol. 37,
      Essay on the reconstruction of the Yuelu Academy, ca. 1249–1333 AD)

It is therefore possible that a semanticized superlative semantics of *da* has arisen
by this stage. The remainder of this section presents a novel account that captures
this semanticization. Our account draws crucial use of the definiteness compo-
nent within the *da*-NumP expression, and differs from previous attempts at deriv-
ing *da*'s superlativeness via the exclusion of alternative numbers (e.g. Jin & Chen
2018). However, a thorough comparison with earlier accounts falls beyond the
scope of this paper, as our purpose is simply to underscore the connection between
da-NumPs' idiosyncratic superlative meaning and *da*'s original 'big' meaning (cf.
fn #8). In § 3.3, we turn to the semantic link between the superlative meaning and
the definite description use of *da*-NumPs.[13]

   Although a lexical *da*-NumP in historical Chinese does not always carry a
definite component, when it does, the uniqueness condition inherent with definite
descriptions triggers an *exactly*-reading that generates a superlative inference. To

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13. We are indebted to an anonymous reviewer for suggesting to us a definiteness-based analysis
might work, and for pointing out potential problems with a number-based analysis. Here we have
implicitly assumed that the definiteness component in the *big*-reading is not lexically encoded by
any part of the phrase. In the previous literature, it is widely assumed that Chinese definiteness
operators can be covert (cf. Cheng et al. 2017).

see this, consider an expression in the form of *san da xing* that takes on the definite scalar meaning 'the three big stars'. Such expression entails the existence of three big stars (here represented by the shorthand A, B, and C) and denotes the maximal element A+B+C (assuming sum formation in mereological terms). To see this formally, we repeat our previous formulation of definite descriptions in (23) as follows:

(28) $\llbracket P \rrbracket = \iota x. [MAX(P(x))]$ (where $\iota x. [f(x)]$ is defined if $f(x)$ has one satisfier, and is otherwise undefined);
$MAX(P) = \lambda x.[P(x) \wedge \neg \exists y [P(y) \wedge x < y]]$ (P is of type <e,t>, and < is the relation of proper parthood).

The referent of the expression *the three big stars* is the unique object satisfying the maximal property MAX (*three big stars*). Given the existence of A, B and C in context, A+B+C is one satisfier of this property, which is easily verifiable given that A+B+C cannot be a proper part of another plurality with three elements. The definedness condition requiring a sole satisfier can be met iff there is no other object in context that is a big star. Otherwise, assuming that a fourth object D also has the property of being a big star, we would have other satisfiers of MAX (*three big stars*), such as A+B+D, thereby causing the definite description to be undefined.

In other words, hearers infer, upon hearing that the three stars are big, that *exactly* three stars are big, and the other stars are *not* big. Recall that we have consistently presupposed the downward monotonicity of degrees (see Example 22). Therefore, to say that an entity is not big compared to a certain standard (further note that an unmodified *big* predicate relates to a context-valued standard) entails that the entity is associated with a lower degree of bigness. This is equivalent to saying that the $\llbracket Num \rrbracket$-many entities referred to by a *da*-NumP are *bigger* than all the other relevant entities, and hence are the $\llbracket Num \rrbracket$ *biggest* entities.

As a result, the superlative inference of a lexical 'big' use, guaranteed by the definedness condition on definite descriptions, renders a plausible semantic explanation for how the superlative interpretation of *da*-NumPs came into being. The hearer first draws a salient superlative inference from the utterance of a lexical *da*-NumP expression, and this invited inference later becomes semanticized. The result is that what starts out as pragmatic implication enters the literal meaning (Heine & Kuteva 2002; Traugott & Trousdale 2013), instantiating a superlative phrase construction.[14] When this happens, the learner takes the changed meaning as input, and re-determines the denotation/meaning of each subpart of the expression in an effort to maintain compositionality. Specifically, the learner takes the

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14. There has been a long and extremely fruitful tradition of research on the semanticization of invited inferences, articulated in Traugott's Invited Inferencing Theory of Semantic Change (cf. Brinton & Traugott 2005 and Traugott & Trousdale 2013 and references therein).

superlative semantics as the overall meaning, and assumes that the meaning of the numeral and the nominal part remain unchanged. As a result, the learner infers that the morpheme *da* takes on the 'biggest' meaning, assigning a group individual to the biggest degree along a context-appropriate scale.

To conclude, in this section we have argued that the degree superlative meaning of *da*-NumPs is connected to the degree semantics of *da* 'big'. Specifically, a 'top Num' pragmatic inference is triggered in a definite *the Num big N* phrase, which entails the existence of [[**Num**]]-many big entities and which is well-formed iff these are the only big entities within the situation. In the next section, we propose that the superlative reading changed to a definite reading when the standard of comparison inherent in the scalar semantics of the gradable predicate may be manipulated to yield a maximal reference, leading to a definite inference.

3.3   Comparison class restriction and domain shift

We suggest in this subsection that the ambiguity between superlatives and definites receives a scale-based explanation. More specifically, the locus of explanation lies in how the standard of comparison of a gradable expression is valued. Of particular interest to us are examples such as the *da*-NumP expression *si da ming xiao* 'four DA famous school', given in § 2.2. We propose that this expression gives rise to ambiguities between a superlative and a definite reading. The expression can mean 'the four greatest famous schools', where the comparison class consists of contextually relevant famous schools, and *da* operates on the comparison class to output the top four among them.

In another reading, *si da ming xiao* is construed as 'the four famous school', referring to a maximal group of four individuals with the property of being famous schools. What is of importance to us is a context featuring four famous schools that are both discourse-salient and more famous than the rest of schools. The speaker, during utterance, might intend the *da*-NumP expression to carry the superlative meaning, referring to the top four among all the famous schools. The hearer might reinterpret the expression in a way in which the gradable expression *famous* exclusively refers to those top four schools. Therefore, ambiguity is induced through shifting the standard of comparison in evaluating famousness.

This systematic ambiguity may inform how *da*-NumPs came to be polysemous between both uses. We find that the historical text of Chinese classics *Xiyouji* 'Journey to the West' contains some of the earliest examples of *da*-NumPs' definite reading. As (29a) and (29b) illustrate, the same *da*-NumP expression anchors distinct referents under two separate situations, although the contextual information is such that a comparison class should remain unchanged. While this is unexpected under a superlative reading, in which the top four individuals within the comparison

class are unique, it is compatible with a definite interpretation, in which the maximal reference is by definition relativized to situation-specific salience.

(29) a. *You   jian na pang liu gou bi si   da tian-jiang*
          moreover see that Pang Liu Gou Bi four **DA** heavenly-general
          jinli   yao   cha.
          address invite tea
          'Moreover, one saw that the four heavenly generals of Pang, Liu, Gou, and Bi greeted him and invited him for tea.'
                                    (*Xiyouji* 'Journey to the West', vol. 51, ca. late 16th century)
     b. *Huang-de na   guangmu yuanshuai shuai ma zhao wen guan si*
         panic-ADV that guangmu Marshal   lead Ma Zhao Wen Guan four
         da tian-jiang   ji   ba-men   da xiao zhong   shen ge
         DA heavenly-general and guard-gate big small collective deity DIST
         shi   bingqi dangzhu dao.
         wield weapon block   way
         'Caught off guard, the Guangmu Marshal led the four heavenly generals of Ma, Zhao, Wen and Guan as well as the gate-guarding group of deities and rushed to block the way, wielding their weapons.'
                                    (*Xiyouji* 'Journey to the West', vol. 58)

It is thus possible that the scale-based ambiguity also contributes to the way the definite reading arises, but apparently more historical evidence is needed before claiming that the ambiguity mechanism discussed here also underlies a theory of change. We shall leave an exploration of this claim to later work.[15] In the following, we expand on the process of standard shift, starting with an overview of research on English intensification and then applying analyses of covert intensification to Chinese. In the previous texts, we have shown that evaluation of positive gradable adjectives relies upon a contextually-determined standard (Klein 1980; von Stechow 1984; Kennedy & McNally 2005). In attributive uses of adjectives, the modified nominals serve to set up the comparison class, and in turn restrict the standard, as the latter is defined as a degree that exceeds the average (or norm) on a given comparison class. This is illustrated by Partee (1995):

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15. In the diachronic works of Chen (2016) and Jin & Chen (2018), the issue of how the definite reading arises is dealt with by positing an intermediate stage mediating between the superlative stage and the definite stage. Such multiple-stage mechanisms are not compatible with the ambiguity-based theory of standard shift presented here, since under the latter framework a superlative phrase has to develop directly into a definite phrase. In future work, we aim to explore the diachronic implications of our idea spelled out here, and evaluate its relative merits against previous diachronic analyses.

(30)　Clyde saw a big bird/elephant.

In (30), *bird* and *elephant* determine the comparison classes, relativized to the group of birds/elephants. A big bird is thus evaluated based on the degree of bigness that is above the average/normal size comparable to birds, and cannot be compared against other animals such as average elephants.

　　Apart from setting up comparison classes to which a standard applies, contextual variables further manipulate the standard by altering the range of comparison classes. In § 3.1, we have posited that the standard for an unmodified positive gradable adjective is calculated relative to the average of an arbitrary, contextually given comparison class (introduced by the *pos* morpheme). The crux of our analysis lies in the phenomenon in which the standard is subject to further manipulation via intensification (Kennedy & McNally 2005). As (31) illustrates, when English intensifiers *really* and *very* modify a gradable predicate, the *really*/*very*-standard locates a degree above the average of a further restricted comparison class, that is, those objects to which the unmodified predicate truthfully applies (von Stechow 1984; Kennedy & McNally 2005; McNabb 2012).

(31)　Drusilla is tall, but Feliz is really/very tall.

That Drusilla is tall means that she is tall compared with an average (contextually given) individual. For Feliz to count as really/very tall, nevertheless, she needs to be taller than an average individual among those individuals to whom the unmodified *tall* applies: Feliz is taller than the average of already tall individuals. In other words, intensification *raises* the standard via domain restriction.

　　In addition to overt intensifiers, standard raising in English may be achieved via assigning prosodic prominence to an unmodified gradable adjective (McNabb 2012). The unmodified predicate *pretty* in (32a), when receiving extra stress (indicated by the use of small capital), is taken to mean that the girl under discussion is pretty when compared against a domain of pretty girls (who walked the red carpet). Similarly, (32b) means that Jerry is not just tall in comparison with an average person, but tall even in comparison with a tall person.[16]

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16. To keep things explicit, the denotation of the intensifier *very* can be specified relative to a context c and the *pos* in the following way, in which *very R* (R stands for an adjectival relation) is true of an object if the degree to which it is R exceeds the average on the R-scale for a comparison class based on those objects that have the property *pos R* in the context of utterance (cf. Kennedy & McNally 2005).

(i)　$[\![very]\!]^c = \lambda R_{\langle e, d, t\rangle} \lambda x \exists d\, [R(x)(d) \wedge d > s_{c'}]$ (predicative use)

Where value of the standard $s_{c'}$ is determined by a lexically specified comparison class C' (as opposed to a contextual comparison class C that is assumed to determine the value s_c in the *pos* morpheme), such that $C' = \lambda y. [\![pos\,(R)(y)]\!]^c$. We can further posit that in cases of standard raising that involve prosodic salience, a null *very* operator is present.

(32)   a.   (Talking about pretty) the girl on the red carpet right now is PRETTY.
  b.   Jerry isn't (just) tall, he is TALL.

Mandarin similarly employs both intensifiers (such as *feichang* 'very') and non-overt strategies to achieve standard raising. (33) features a naturally occurring utterance, in which the unmodified adjectival predicate in *tui chang* 'leg long' compares a model against other catwalking models, who typically have long legs compared with average individuals.

(33)   [Context: audience making comments while seated next to a runway during a fashion show]
  Nei-ge   tui chang de   mote   yifu   hai   bucuo.
  that-CLF leg long   REL   model clothes rather not.bad
  'That model with (really) long legs got quite good clothes with her.'

In other words, the standard of comparison in (33) is calculated based on a comparison class of individuals, to whom the property of having long legs already truthfully applies. Note that in the above example, both a superlative reading and a *really*-reading are verified by the same situation. 'That girl with really long legs' is equivalent to 'that girl with the longest legs'. We suggest that this process of covert intensification underlies the ambiguity between the superlative reading and the definite reading in *da*-NumPs. Specifically, we argue that covert intensification takes place when the noun phrase within a *da*-NumP includes a left gradable adjective attribute, as in the example *si da ming xiao* "four DA famous school". Via domain raising, *ming* changes from its original meaning of being famous relative to an average standard and comes to mean 'really famous'. As (34) schematizes, the superlative interpretation left of the arrow is alternatively analyzed as the definite interpretation right of the arrow:

(34)   Informal schema:
  'the top four famous schools'
  λX. There exists a degree d such that every member of X is d-famous and for all y ≠ X, y is not d-famous.

  →

  'the four (really) famous schools'
  ιX. There exists one unique group that is really famous and X is that group

The hearer can still derive the appropriate truth conditions for the sentence, if, simultaneous to the change in the overall meaning, *da* now denotes a definite operator rather than a superlative operator. With this denotation, the sentence maintains the appropriate truth condition that is verified by the same situations as before (i.e. if these four scholars are the top four, then they are very famous). The result is that the part of the *da*-NumP that follows *da* no longer denotes a comparison class.

Interlocutors redetermine the meaning contribution of each subpart of an expression in ways that maintain compositionality. As an outcome of this process, the *da* morpheme is reassigned the denotation of a definiteness operator by the hearer.

4. Conclusion

In Mandarin Chinese, a morpheme *da* (derived from the adjective *da* 'big') may intervene between a numeral and a noun to form a distinct numeral phrase construction. Based on corpus data, this paper argues that *da*-NumPs have two uses. One use is scalar: *da* contains a superlative meaning component, by pairing a subset of individuals with a degree such that no other individuals (that are in the extension of N) possess this degree (Heim 1995). The *da*-NumP thus refers to the top ⟦*Num*⟧ entities among a larger comparison class in terms of a context-appropriate graded property. The second use is non-scalar: *da* functions as a definiteness marker, such that ⟦*NumdaN*⟧refers to the maximal group individual that satisfies the property $N(X)$ (von Fintel et al. 2014). In both uses, *da*-NumPs differ from other truth-conditionally identical alternative constructions in that they encode a significance construal (in the sense of Su 2017) and indicate the speaker-oriented evaluation of the relevant situation as noteworthy.

The current study claims that the original 'big' meaning of the morpheme *da* is crucial in inducing an *exactly*-interpretation that leads to the superlative use. Specifically, a covert definite component within a historical *da*-NumP with a 'big' meaning invites the inference that the property of bigness is associated with ⟦*Num*⟧-many individuals. This *exactly*-interpretation, arisen out of the uniqueness requirement imposed by definite descriptions, subsequently enters the literal meaning, where the adjectival *da* simultaneously encodes the dual meaning of gradable property and superlativeness.

In addition, we argue that when a gradable component and a definite component are both present within a *da*-NumP, a systematic ambiguity between a superlative reading and a definite description reading obtains. Specifically, we propose that standard shift causes the nominal argument of *da* to lose its comparison class function during evaluation. We assume speakers observe the principle of compositionality during interpretation, and in cases of ambiguity, are prone to a recalculation that preserves compositionality. When *da* loses the superlative meaning as a result of its nominal argument ceasing to be interpreted as a comparison class, a definiteness marker interpretation of *da* enables it to again combine directly with the nominal, in order to encode maximal informativity.

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Abbreviations

ADV	adverb	OBJ	object marker
COP	copula	POSS	possessive
CLF	classifier	PRF	perfective aspect marker
DIST	distributive operator	PROG	progressive aspect marker
EXP	experiential aspect marker	PRT	particle
NEG	negation	REL	relativizer
NMLZ	nominalizer	SUP	superlative operator

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