

## The semantic composition of event counting expressions within nominals in Mandarin Chinese\*

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**Abstract** Event counting expressions like *three times* are often thought of as adverbial modifiers of a verbal projection. This study establishes and analyzes an apparently related but puzzling phenomenon in Mandarin Chinese whereby an event counting expression consisting of a numeral and an event classifier is introduced within a nominal syntactic argument to a verb, that also contains a thematic nominal. Closely examining the relevant interpretive properties, I show that such constituents are able to express counts of events independently of composition with the verb. Moreover, the phenomenon should be understood to reflect a close syntax-semantic parallelism between event classifiers and individual classifiers in Mandarin Chinese: while individual classifiers express counts of individuals introduced by the following noun, event classifiers facilitate counts of events associated with such individuals (cf. Deng 2013). This means that the thematic nominal inside of the event classifier phrase must be interpreted as an event description on its own. These findings lend empirical support to the idea of total thematic separation and related proposals (Schein 1993 among others).

**Keywords:** event classifier, event counting, pluractionality, thematic separation

### 1 Introduction

It is usually thought that the formal similarity between the domains of *individuals* and *events* are reflected in grammatical analogies between NPs and VPs (Bach 1986; Krifka 1989). This paper presents a new kind of grammatical manifestation of this relationship in the Mandarin Chinese classifier system. Here, we find different classifiers facilitating counts of individuals and events, and yet, there are strong parallels in both their grammatical realization and in their semantic functioning.

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In this paper, I argue for a new analysis of event classifiers which reflects those parallelisms, fixing the event-counting operation of the event classifiers internal to the nominal and independently of its enclosing VP.

I begin with an empirical puzzle raised by the minimal pair in (1). Contrasting (1a) and (1b), we observe that substitution of the classifier from *ge* to *xia* completely changes what's being counted. In (1a), with the classifier *ge* (iCl), the Num(eral)-Cl(assifier) phrase expresses a count of the number of sandbags, to which an unspecified number of hittings were done by Zhangsan. In (1b), with the classifier *xia* (vCl), the Num-Cl phrase now expresses a count of the total number of hittings that Zhangsan did to an unspecified number of sandbags<sup>1</sup>. Given that *san ge shadai* in (1a) is uncontroversially an object of the verb, a compositional puzzle arises if (1b) has the same structure: *san xia* (three vCl) must first compose with a nominal that identifies event participants (thematic nominal), yet ultimately express a count not of those individuals, but of the events in which they participated.

- (1) a. Zhangsan da-le [san ge shadai]  
Zhangsan hit-ASP three iCl sandbag  
'Zhangsan hit three sandbags.'
- b. Zhangsan da-le [san xia shadai]  
Zhangsan hit-ASP three vCl sandbag  
'Zhangsan hit some sandbags three times (three punctual hittings).'

This puzzle could be avoided under a view on which (1b) has a different underlying structure than (1a), e.g. one which allows a Num-vCl phrase to directly compose with a verbal expression. This view is reflected by most previous syntactic as well as semantic analyses of cases like (1b) (Gu 1995; Huang, Li & Li 2009; Deng 2013; Donazzan 2013; Huang 2018; Ye & Guo 2023 among others). However, below I present novel empirical observations that challenge such views, providing strong evidence that the syntactic structures of (1a) and (1b) are in fact the same. In particular, one group of facts show that both Num-iCl-NP and Num-vCl-NP as such can occupy derived A and A' positions related to a gap in the internal argument position of the verb, suggesting that both are base-generated there. Therefore, the Num-vCl-N phrase in (1b) is likely a genuine, canonical numeral classifier phrase just as the one in (1a) is. This resemblance is further confirmed by the fact that the syntactic and semantic requirements on the nominals that form a constituent with iCl/vCl are the same (e.g. they must be unquantified, indefinite bare NPs). This suggests that the compositional puzzle is genuine and needs addressing.

<sup>1</sup> Note that it is possible to specify the number of events and participants simultaneously, but a slightly different construction must be used; see (10).

To address the parallelisms between *ge* (iCl) and *xia* (vCl), I argue for and provide an implementation of the idea that they are simply two different lexical items of the same category, and that they carry out the same semantic mechanisms in the domains of individuals and events, respectively. In particular, iCls facilitate the counting of individuals picked out by the following nominal, and analogously vCls facilitate the counting of events picked out by the following nominal (cf. [Deng 2013](#)). But how does this square with the fact that *xia* (vCl) in (1b) combines with a noun that doesn't seem like an event description? I show that this follows if we assume total thematic separation – that all thematic arguments are separated from the meaning of the verb – coupled with proposed mechanisms allowing thematic nominals to be “theta-marked” before they composing with the verbal predicate ([Krifka 1992](#); [Schein 1993](#); [Hornstein 2002](#); [Pietroski 2005](#) among others). On these proposals, a theta-marked nominal is in fact an event description. The fact that *xia* (vCl) can first compose with *shadai* (‘sandbag’) in (1b) yet count events is thus permitted. If successful, this study thereby provides strong empirical support for total thematic separation and related proposals.

In order to maintain a manageable empirical domain, this study focuses only on one particular vCl – *xia*. In fact, *xia* is only compatible with semelfactive event predicates (henceforth, *semelfactive event classifiers*, abbreviated as *svCls*). There are many other event classifiers in Mandarin Chinese with their own idiosyncratic properties, and there are only a few previous studies addressing the most salient syntactic/semantic differences between several of them ([Donazzan 2013](#); [Deng 2013](#); [Zhang 2017](#)). By presenting novel and important facts associated with *xia* (svCl) and arguing for its proper analysis, this study will provide a basis for further investigations of the syntax-semantic properties of various vCls in Mandarin Chinese, and ultimately support a more robust typology of the broader class.

This paper is structured as follows. §2 reviews representative syntactic and semantic analyses related to event counting expressions in Mandarin Chinese. §3 presents novel empirical observations that challenge previous analyses and motivate my proposal. I then detail my proposal in §4, and conclude in §5.

## 2 Previous work

In this section, I briefly summarize some representative syntactic and semantic analyses relevant to svCls in Mandarin Chinese.

### 2.1 Syntactic analyses

Broadly speaking, there are three kinds of syntactic analyses intended for or applicable to a numeral(Num)-svCl phrase: what I will call the verbal functional head

analysis (§2.1.1), the adverbial adjunct analysis (§2.1.2) and the V-complement analysis (§2.1.3). One important commonality among all of these analyses is that Num-svCl never forms a constituent with a following thematic nominal at any stage of the derivation. This is to be challenged in the next section.

### 2.1.1 Verbal functional head analysis

Zhang (2017) proposes that vCls in Mandarin Chinese head verbal functional projections. For svCls particularly, which Zhang refers to as Event-Internal Classifiers, she proposes that they head a *UnitP* projection under vP, with *Unit* (realized as svCls like *xia*) taking VP as its complement, as shown in (2). Given this base structure, further syntactic movements must take place to derive the surface word order.

(2)  $[_{VP} \text{ Subj } [ v [_{UnitP} \text{ Num } [_{Unit} \text{ } xia ] [_{VP} \text{ verb Obj } ] ] ] ] ]$

### 2.1.2 Adverbial adjunct analysis

Another kind of analysis, represented by Huang et al. 2009 and Huang 2018, proposes that a Num-vCl phrase is a V-bar level adverbial adjunct, which is hierarchically higher than the verb and any argument in the V-complement position, while lower than any argument at Spec,VP. This structure is shown in (3). The proposal of such a unique adjunction site of a Num-vCl phrase is to account for the fact that sometimes an object appears linearly to the left of Num-vCl and sometimes to the right. Parts of the named works are devoted to understanding when an object can/must occupy which position; I briefly discuss this, later.

(3)  $[_{VP} (\text{Obj}) [_{V'} [\text{Num-vCl}] [_{V'} \text{ verb } (\text{Obj}) ] ] ]$

These authors' analyses are based on examples with *ci*, the occasion-related classifier (oCl) that facilitates counts of *occasions* (Cusic 1981). Even though the syntax and semantics of oCl and svCl might ultimately be different, the properties of oCl-examples that these analyses aim to capture also carry over to svCl-examples. These authors also don't suggest any structural difference between oCl and svCl, so I also consider these to be potential analyses for sentences with svCls.

### 2.1.3 V-complement analysis

The final kind of analysis that I consider proposes that a numeral-svCl phrase is simply directly selected by V as its complement (Gu 1995; Deng 2013). A representative analysis of this kind is offered by Deng (2013), who proposes that svCl always selects for an "event noun": a noun that describes events. Examples

like those he considers function as a cognate object of the verb, and may be overt or covert, as suggested by (4a) and (4b).

- (4) a. Zhangsan da-le [san xia erguang]  
 Zhangsan hit-ASP three svCL slaps-on-the-face  
 ‘Zhangsan did three slaps on someone’s face.’  
 (cf. Deng 2013: ex. 26b)
- b. Zhangsan dou-le [san xia e]  
 Zhangsan tremble-ASP three svCl covert-noun  
 ‘Zhangsan had three trembles.’  
 (cf. Deng 2013: ex. 1b)

Given such a proposal, in order to account for the word order in sentences like (1b), Deng proposes that a [numeral-svCl  $n_{null}$ ] phrase is “re-analyzed” with the verb as a complex verb ( $V^o$ ), and it subsequently undergoes verb raising to a position higher than Spec,VP, where the object is proposed to be located. *shadai* (‘sandbags’) in (1b) would be considered as such an object under this proposal. This process is sketched in (5). A very similar analysis is proposed in Gu 1995: 64.

- (5)  $[_{V^o} V\text{-[Num-svCl } n_{\text{covert}} ] ] \dots [_{\text{VP}} [_{\text{Spec,VP}} \text{Obj}] [_{V'} t_{V^o} t_{\text{Num-svCl-n}} ] ]$
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## 2.2 Semantic analyses

Most existing formal semantic analyses of svCls treat them as denoting functions that apply directly or indirectly to the meaning of verbal projections of different levels. I briefly summarize the key ideas behind some representative semantic analyses.

Ye & Guo (2023) propose that a num-svCl phrase is an adjunct modifier to the verb itself, adjoined before any argument is introduced. Semantically, they propose that Num-svCl denotes a very general set consisting of complex atomic events of the specified cardinality; that set intersects with the verb’s denotation and picks out its subset consisting of the particular complex events of the expressed cardinality. Donazzan (2013) proposes that a svCl denotes a function that applies to the meaning of an entire verb phrase ( $\llbracket \text{VP} \rrbracket$ ), and returns all atoms in  $\llbracket \text{VP} \rrbracket$  for further semantic computation. Deng (2013) proposes that Num-svCl indirectly counts the events denoted by the verb by applying the count to the cognate object of the verb.

What’s common in these semantic analyses is that the meaning of Num-svCl is always more closely tied to the verb or a verbal projection than to any thematic nominal. This is to be challenged in the next section.

### 3 Novel empirical observations

There are novel empirical observations that pose challenges to the previous syntactic and semantic analyses sketched in the previous section, and which any adequate theory of the syntax/semantics of vCI constructions will need to accommodate. I present syntactic and semantics observations in turn.

#### 3.1 Syntactic observations

In general, it appears that a Num-svCI phrase in fact forms a syntactic constituent with an NP that follows it<sup>2</sup>, and such a constituent appears as a syntactic argument of the matrix verb. Indeed, [Deng \(2013\)](#) already argues that this is so when the NP is an event noun, as in (4a). This section focuses on cases where Num-svCI forms a constituent with a NP that identifies participants of the matrix event, such as *shadai* (sandbags) in (1b). Such a constituency of the Num-svCI-NP phrase in (1b) is established through an extended comparison between the syntactic distribution of Num-svCI-NP in (1b) and a canonical individual classifier phrase object in (1a).

I argue by analogy. Since the two strings, Num-svCI-NP (henceforth svCIP) in (1b) and Num-iCI-NP (henceforth iCIP) in (1a), have a very similar syntactic distribution, and since the latter is uncontroversially a syntactic argument of the verb in (1a), I conclude that the former is likely also a syntactic argument of the verb in (1b). To evidence this claim, I show that these two strings can both occupied some derived A and A' positions related to their canonical base position in (1b) and (1a).

First, svCIP and iCIP can both appear in some A-positions that are related to a gap in the internal argument position of the verb. (6) shows that both can be the subject in what's called a non-canonical *ba*-construction with a transitive-resultative complex predicate (cf. [Chen 2023](#): 123, ex.11a). This is a kind of *ba*-construction where the subject appears promoted from the internal argument position of the matrix verb that also serves as the causer argument of an embedded resultative clause.

(6) *ba*-construction

- a. [san xia shadai]<sub>i</sub> ba Zhangsan<sub>j</sub> da <sub>i</sub> [<sub>j</sub> lei le]  
 three svCI sandbag BA Zhangsan hit tired ASP

‘There are three hittings of some sandbags that Zhangsan did such that he got tired from doing so.’

<sup>2</sup> There are cases reported as grammatical where a DP linearly follows a vCI ([Gu 1995](#): ex. 25a, [Deng 2013](#): ex. 69a), even though controversial ([Huang 2018](#): footnote 6). However, it can be verified that a Num-svCI-DP sequence doesn't pass all the constituency tests that this section provides for a Num-svCI-NP sequence. Therefore, a Num-svCI-DP sequence should be analyzed differently. An analytical possibility is object extraposition, as you will see in the discussion around (10) that a DP object normally precedes Num-svCI.

- b. [san ge shadai]<sub>i</sub> ba Zhangsan<sub>j</sub> da <sub>-i</sub> [<sub>-j</sub> lei le]  
 three iCl sandbag BA Zhangsan hit tired ASP

‘There are three sandbags such that Zhangsan got tired from hitting them.’

Moreover, svCIP and iCIP can both appear as the subject in a *bei*-construction (passive), followed by a resultative clause, as shown in (7). This is also a construction where the subject is related to a gap in the internal argument position of the verb.

(7) *bei*-construction

- a. [san xia shadai]<sub>i</sub> bei Zhangsan da <sub>-i</sub> de [<sub>-i</sub> hen xiang]  
 three svCl sandbag BEI Zhangsan hit DE very loud

‘There were three hittings of some sandbags that Zhangsan did, and they were loud as a result of his efforts.’

- b. [san ge shadai]<sub>i</sub> bei Zhangsan da <sub>-i</sub> de [<sub>-i</sub> hen pojiu]  
 Three Cl sandbag BEI Zhangsan hit DE very worn.out

‘There were three sandbags that Zhangsan hit, and as a result these sandbags were worn out.’

Second, it appears that svCIP and iCIP can both appear in some A’-positions that are related to a gap in the internal argument position of the verb. (8) shows that these can both appear as a relative head noun that is relativized to the internal argument position of the verb.

(8) Relativization

- a. [Zhangsan da <sub>-i</sub> de] [san ge shadai]<sub>i</sub> hen da  
 Zhangsan hit DE three iCl sandbag very big

‘The three sandbags that Zhangsan hit are very big.’

- b. [Zhangsan da <sub>-i</sub> de] [san xia shadai]<sub>i</sub> hen xiang  
 Zhangsan hit DE three svCl sandbag very loud

‘The three hittings of sandbags that Zhangsan did were very loud.’

Furthermore, both of them can also undergo focus fronting, as shown in (9). In these cases, they are also linked to the internal argument position of the verb.

(9) Focus fronting

- a. Lian [wushi xia shadai]<sub>i</sub> Zhangsan dou da-le <sub>-i</sub>  
 even fifty svCl sandbag Zhangsan DOU hit-ASP

‘Zhangsan even hit some sandbags fifty times.’

- b. Lian [wushi ge shadai]<sub>i</sub> Zhangsan dou da-le <sub>-i</sub>  
 even fifty iCl sandbag Zhangsan DOU hit-ASP  
 ‘Zhangsan even hit fifty sandbags.’

While (6) - (9) strongly suggest that svCIP in (1b) and iCIP in (1a) are both the internal argument of the verb, additional examples show that svCIP and iCIP furthermore share important internal properties. Note that in a canonical iCIP (1a), the enclosed nominal can only be a bare common noun (NP), and this is considered trivial for iCl cases because quantified NPs are just built on bare NPs. However, in svCl cases like (1b), the thematic object that forms a constituent with the preceding svCl must also be a bare NP.

If the object is a quantified NP or a DP, it must precede Num-svCl, as in (10), and it can be verified that such an object and the following Num-svCl don’t form a constituent that passes the same constituency tests<sup>3</sup>.

- (10) Zhangsan da-le [liang ge shadai]/[Lisi] [san xia]  
 Zhangsan hit-ASP [two iCl sandbag]/[Lisi] [three svCl]  
 ‘Zhangsan made three punches to two sandbags/Lisi.’

Why only bare NPs can follow Num-svCl is not trivial, especially if Num-svCl and a following bare NP “object” don’t form a constituent according to Huang et al. 2009 and Huang 2018. However, if they do, as suggested by (6)-(9), this fact can alternatively be understood as further evidence for the structural parallelism between iCIP and svCIP, such that they place the same selectional restrictions on the following nominal.

I conclude that, on balance, it is preferable to see the minimal pair (1b) and (1a) as having the same structure. If I am right, this challenges all previous syntactic proposals intended for sentences like (1b), since none of them treat a Num-svCl and its following thematic nominal together as a syntactic constituent projected as the complement of the verb.

### 3.2 Semantic observations

Having motivated that Num-svCl-NP (svCIP) in sentences like (1b) is a constituent and the internal argument of the verb, this section concerns its meaning, which is not as transparent as that of Num-iCl-NP (iCIP) in (1a). When the thematic NP describes individuals, Num-svCl-NP describes sums of atomic events with certain cardinality, with those individuals said to bear certain relations with these events.

<sup>3</sup> For these cases, I agree with Deng (2013) that they should be analyzed as double object constructions with a null nominal within svCIP.

This section concerns how the events are identified, and finds that they may be fixed quite independently of the verb.

Returning for a moment to one of our central cases, the constituent like *san xia shadai* ('three svCl sandbag') in (1b) describes sums of three hittings done to sandbags. Since in that case the verb was 'hit', it would make some intuitive sense if the svCl composes with the verb or one of its projections to deliver such a count. However, the fact that *san xia shadai* ('three svCl sandbags') itself behaves like the internal argument of the verb ('hit') as shown in §3.1 suggests that such a count should arise due to composition with *shadai* ('sandbags'), before the verb is merged. How could such a constituency give rise to such a semantics?

The sentence (11) with matrix verb 'hear' replacing 'hit', is instructive. In this case, the hearing events and the actions done to the sandbags are clearly not the same. Rather, whatever those actions were that were done to the sandbags, those were what Zhangsan heard. Here, it is clear that the svCl does not count the events described by the matrix verb. There isn't even a requirement that the heard events were of the same type: (11) can truthfully be used to describe situations where e.g. Zhangsan heard a loud kicking of a sandbag plus two loud punchings of a sandbag.

- (11) Zhangsan tingjian-le [san xia shadai]  
 Zhangsan hear-ASP three svCl sandbag  
 'Zhangsan heard three actions done to sandbags.'  
 #'Zhangsan heard the sound of sandbags three times.'

There is another reason to think that the event count in this case doesn't arise through composition with the verb: *tingjian* ('hear') describes achievements of 'having heard something', which are not compatible with svCls in Mandarin<sup>4</sup>.

The sentence (12) is an additional helpful example. Combined with a demonstrative in (12), *na san xia shadai* ('DEM three svCl sandbags') features as the subject of the sentence. Here, there is no question that no count of "being pretty" is invited; rather, the subject picks out the three actions done to some sandbags in the context, and says that they are pretty. Just as with the previous example in which the predicate type doesn't restrict the nature of those actions, the collection of three actions in this case can include actions of different types. For example, in the context of a martial arts performance, where actions done to sandbags can be pretty, (12) can describe 1 pretty kicking + 1 pretty punching + 1 pretty hitting with a bat, etc.

- (12) na [san xia shadai] hen piaoliang  
 DEM three svCl sandbag very pretty  
 'Those three actions done to sandbags were very pretty.'

<sup>4</sup> To count events described by achievement predicates, the occasion-related classifier (oCl), e.g. *ci*, must be used (Donazzan 2013).

These examples challenge the central idea behind previous semantic analyses of svCl(P), all of which propose that the svCl or a Num-svCl phrase semantically combines with the verb or VP and counts the events that those expressions describe. However, examples (11) and (12) in this section show that a Num-svCl phrase can perform a meaningful count of events that are in fact independent of any verb.

### 3.3 Taking stock

The main puzzle is how a seemingly adverbial element – an event counting expression – is composed with a thematic nominal within a larger nominal constituent, itself the syntactic object of a verb. Furthermore, as we have seen, the core example repeated in (13a) is related to four other cases repeated in (13b - 13d) due to their structural resemblance, but these cases have very different event structural properties.

- (13) a. Zhangsan da-le [CIP san xia shadai]  
 Zhangsan hit-ASP [ three svCl sandbags]  
 ‘Zhangsan hit some sandbags three times.’
- b. Zhangsan da-le [CIP san ge shadai]  
 Zhangsan hit-ASP [ three iCl sandbags]  
 ‘Zhangsan hit three sandbags.’
- c. Zhangsan tingjian-le [CIP san xia shadai]  
 Zhangsan hear-ASP [ three svCl sandbags]  
 ‘Zhangsan heard three actions done to some sandbags.’
- d. Zhangsan da-le [CIP san xia erguang]  
 Zhangsan hit-ASP [ three svCl slaps-on-the-face]  
 ‘Zhangsan did three slaps on (someone’s) face.’  
 (Deng 2013: ex. 26b modified)

A secondary puzzle, then, is how to understand these different properties which arise from the same structure. In the next section, I provide an explicit formal analysis that not only addresses the main puzzle, but also offers a simple and principled explanation to the variation summarized in (13).

## 4 Formal analysis

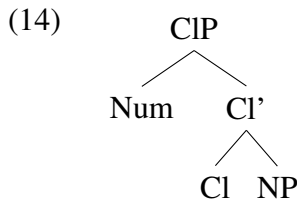
My core proposal implements the idea that svCls like *xia* and individual classifiers (iCls) fall under the same syntactic category – Cl(assifier), but with slightly different semantics. On this picture, their internal and external syntactic properties are mostly the same, with the main difference in their semantics reflecting the fact

that iCIs operate on individuals and svCIs operate on events. This proposal is similar in spirit to that proposed for svCI by Deng (2013), who also implements a structural parallelism between iCIPs and svCIPs. An important difference is that my implementation is based on another kind of syntactic-semantic analysis of classifiers (see Jiang, Jenks & Jin 2022 for empirical arguments). Furthermore, my analysis is unique in accounting for cases where a thematic nominal is within a svCIP.

My analysis combines one of several syntactic-semantic analyses of iCIs with a couple of ingredients from event semantics. I first introduce those ideas that form the fundamental building blocks of my analysis, and then the details of my analysis and how it accounts for the facts presented in previous sections.

#### 4.1 A syntax-semantics for Mandarin classifiers

I adopt the syntactic analysis in (14), in which a classifier selects for a noun and projects a numeral at its specifier (Li 2011; Jiang 2012 among others).



I then follow the semantic proposal of individual classifiers (iCIs) by Jiang (2012). There are several components of Jiang’s proposal. First, she adopts the view that numerals denote “counting functions” of type  $\langle et, et \rangle$  (Link 1987; Bale, Gagnon & Khanjian 2011 among others). These functions require that the set of individuals they apply to consists of individuals with atomic parts, and these functions return a subset of these individuals: the ones consisting of exactly  $n$  atoms. This is formalized as (15). (I will soon modify this to accommodate event-counting.)

$$(15) \quad \llbracket \text{num} \rrbracket = \lambda P_{et}. \lambda x_e. P(x) \wedge |x| = n \quad (\text{first version})$$

For the semantics of iCIs, Jiang proposes that they are responsible for “checking the atomicity” of the individuals in the set  $P$  denoted by the noun<sup>5</sup>, and for applying

<sup>5</sup> Despite noting this analytical option of Mandarin bare nouns, Jiang (2012) leans towards another one in which Mandarin bare nouns denote *kinds* (Carlson 1977; Chierchia 1998). If so, the semantics of iCIs would be as in (i), where the classifier maps a kind  $k$  to a predicate true of ‘instantiations of  $k$ ’ ( ${}^U k$ ). As I understand it, nothing empirical directly falsifies the alternative (bare-noun-as-predicates) view for Mandarin Chinese. I also see no conceptual or empirical benefit to extending the kinds-based analysis to events, as needed for my study. Hence, to simplify matters, I adopt the bare-nouns-as-predicates view with requisite adjustments.

(i)  $\llbracket \text{ge} \rrbracket' = \lambda k. \lambda N_{\langle et, et \rangle}. N(\text{At}({}^U k))$

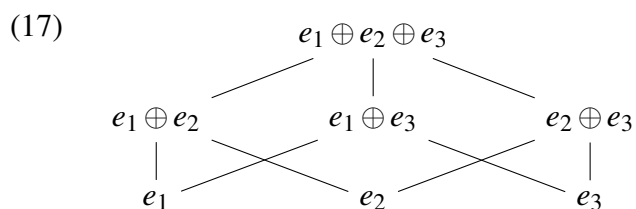
the counting function denoted by its project numeral. This is formalized as in (16). Here,  $At_{\langle et, et \rangle}$  implements the “atomicity checking” by returning all atoms in  $P$ , if any, and their sums. For any  $P$  without atoms,  $At(P)$  would return the empty set. For the rest of this paper, I label a non-empty set or predicate returned by  $At(P)$  as  $P_{At}$ .

$$(16) \quad \llbracket ge \rrbracket = \lambda P_{et}. \lambda N_{\langle et, et \rangle}. N(At(P))$$

#### 4.1.1 Elements from event semantics

I assume two broad proposals from event semantics for how to handle event pluractionality and thematic binding. I present these in turn.

First, I follow the lattice-theoretic approach to event pluractionality (Bach 1986; Krifka 1989) based on Link 1983. Under this view, the denotation of an event predicate with plural properties (atomicity, cumulativity) has a semi-lattice structure, containing atomic events and their sums, as illustrated in (17).



Second, I adopt the “total separation” version of Neo-Davidsonianism under which verbs, even transitive ones, are interpreted as monadic predicates of events, with thematic participants of those events all introduced separately from the meaning of the verb (Krifka 1992; Schein 1993; LaTerza 2014 among others).

$$(18) \quad \textit{the denotation of 'hit' under total separation}$$

$$\llbracket \textit{hit} \rrbracket = \lambda e. \textit{hit}'(e)$$

Under this view, there must be a mechanism that introduces thematic predicates in the logical form of an extended verb phrase (e.g.  $\textit{theme}(e, x)$  in (19)), such that verbal events can be related to their thematic participants that are picked out by nominals in the structure, e.g. an object of the verb.

$$(19) \quad \textit{desired logical form of the VP [hit John]}$$

$$\llbracket \textit{hit John} \rrbracket = \lambda e. \textit{hit}'(e) \wedge \textit{theme}(e, j)$$

As to how thematic predicates are introduced, I assume that nominals are “theta-marked” with those markings determining a specific relation to events (Pietroski 2005; LaTerza 2014). More precisely, I follow the feature approach (Chomsky 1981; Hornstein 2002, summarized in LaTerza 2014: 27) wherein thematic nominals bear a

particular formal syntactic theta-feature which returns a property of events in which the named entities participate in a given way. This interpretive process is formalized in (20) for  $\langle e, t \rangle$  or  $\langle v, t \rangle$  theta-marked nominals (the latter will be important for the *hear*-type examples, e.g. (11)). As is standard on Neo-Davidsonian approaches, the semantic significance of combining verbs with theta-marked nominals is therefore conjunctive (cf. Pietroski 2005).

- (20) a.  $\llbracket N_{\langle \alpha, t \rangle} \rrbracket = \lambda x_{\alpha}. x \in \{ \dots \}$   
 b.  $\llbracket N_{[theme]} \rrbracket = \lambda e_v. (\exists x) [\llbracket N \rrbracket(x) \wedge theme(e, x)]$

As will become clear below, I must assume a relatively flexible theta-assignment mechanism, as compared to more restrictive ones (e.g. Baker 1988: the Uniformity of Theta Assignment Hypothesis). Due to limited space, I won't commit to any explicit such mechanism, but leave exploration of the specific consequences of this aspect of my analysis for future work.

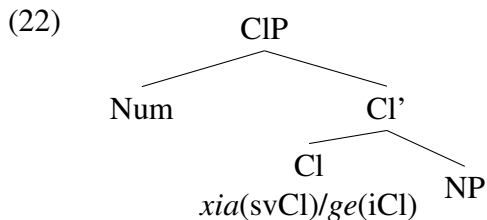
## 4.2 The proposal

My central proposal reflects the idea that svCls and iCls are different lexical items of the same syntactic category – Cl, and their semantic functions are parallel, but they operate in different domains.

For the technical implementation of this idea, I first generalize the semantics of numerals from (15) and the  $At(P)$  function within (16), as in (21), such that these functions can also apply to predicates of events. This is legitimized by the adopted parallel formal structures of events and individuals, exemplified by (17) for events. In other words, I claim that these operators care about formal aspects of such structures, and not specific details of whether they feature individuals or events.

- (21) a.  $\llbracket num \rrbracket = \lambda P_{\alpha t}. \lambda \phi_{\alpha}. P(\phi) \wedge |\phi| = n$  (final version)  
 b.  $At_{\langle \alpha t, \alpha t \rangle}(P)$  returns all atoms in P, if any, and their sums.

Turning to classifiers, I have proposed that both iCls and svCls are associated with the same syntactic structure, repeated in (22), and they carry out the same semantic operations. The only difference is that  $\llbracket iCl \rrbracket$  operates on predicates of individuals and  $\llbracket svCl \rrbracket$  operates on predicates of events. The semantics of svCl *xia* I propose is as in (23a), alongside that of iCl *ge* (23b) from Jiang 2012.



- (23) a.  $\llbracket \text{xia} \rrbracket = \lambda \mathbf{P}_{vt}. \lambda N_{\langle \alpha t, \alpha t \rangle}. N(At(P))$   
 b.  $\llbracket \text{ge} \rrbracket = \lambda \mathbf{P}_{et}. \lambda N_{\langle \alpha t, \alpha t \rangle}. N(At(P))$

Parallel to what  $\llbracket \text{iCl} \rrbracket$  does to predicates of individuals ( $P_{et}$ ), a  $\llbracket \text{svCl} \rrbracket$  takes a predicate of events ( $P_{vt}$ ), returns all atoms and their sums, and applies the numeral function to this subset to pick out the sums of the intended cardinality.

Next, I show how this proposal derives the semantics of Num-svCl-NP phrases and all related properties discussed in §3, and then how it enables a principled analysis of different event-structural properties stemming from the same structure.

### 4.3 Deriving the semantics of Num-svCl-NP

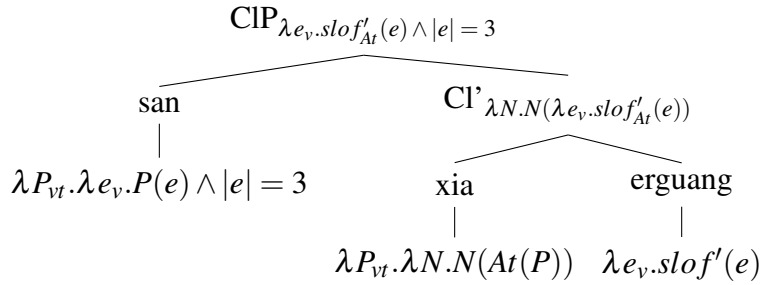
The proposed semantics for svCls restricts them to composition with predicates of type  $\langle v, t \rangle$ . This agrees with Deng (2013)’s generalization that Num-svCls are able to compose with event nouns, such as *erguang* “slaps on the face”. However, in §3 we saw that svCls can also compose with nouns that are not inherently eventive. This section addresses that puzzle.

Given the proposed theta-marking rule (20b), an  $\langle e, t \rangle$  lexical noun is interpreted as of type  $\langle v, t \rangle$  when theta-marked, and therefore Deng’s generalization can be extended to include those as well. This is what I will argue is the case for (13a), repeated in (24a), thus offering a uniform analysis of the classifier phrase there as well as for (13d), repeated in (24b), that is covered by Deng’s analysis. In what follows, I will present the compositional details given the set of ingredients I have just laid out.

- (24) a. Zhangsan da-le [CIP san xia shadai]  
 Zhangsan hit-ASP [ three svCl sandbags]  
 ‘Zhangsan hit some sandbags three times.’  
 b. Zhangsan da-le [CIP san xia erguang]  
 Zhangsan hit-ASP [ three svCl slaps-on-the-face]  
 ‘Zhangsan did three slaps on (someone’s) face.’

First, for the svCIP in (24b), meaning “three slaps on the face”, its semantic composition is demonstrated in (25a). We have an event noun *erguang* “slaps on the face” denoting a set of atomic and complex “slaps on the face” events. The atomicity-checking function  $At(P)$  in  $\llbracket \text{xia} \rrbracket$  is applied to  $\llbracket \text{erguang} \rrbracket$  and returns the same predicate, since slaps on the face events are understood to be atomic.  $\llbracket \text{san} \rrbracket$  is then applied to  $\llbracket \text{erguang} \rrbracket$  and returns a set of only complex slaps on the face events consisting of three such atomic events. The resulted semantics of CIP in (25a) then intersects with the verbal event predicate *da* (to hit), deriving the desired meaning of the VP in (24b) as in (25b): a set of “three-hittings” that are also “slaps on the face”.

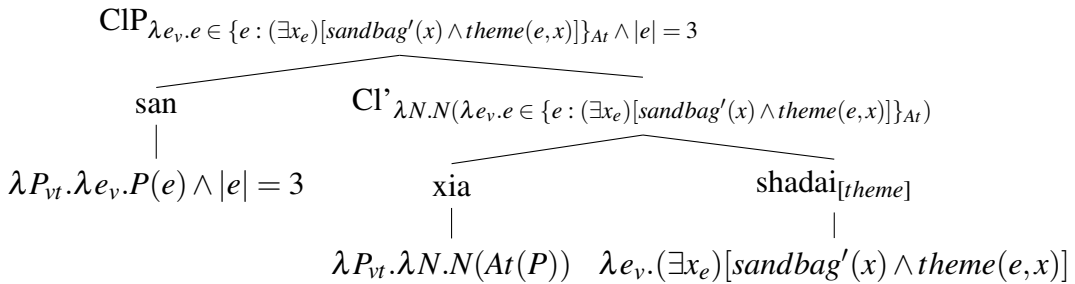
(25) a.



b.  $\llbracket \text{VP}_{(24b)} \rrbracket = \lambda e_v. \text{hit}'(e) \wedge \text{slof}'_{At}(e) \wedge |e| = 3$

For the svCIP in (24a) meaning “three actions done to sandbags”, its semantic composition is demonstrated in (26a). Here, theta-marked *shadai* “sandbags” denotes a set of events done to some sandbags (per (20b)). Absent any lexical restriction to atoms, in this case  $At(P)$  applies to  $\llbracket \text{shadai}_{[\text{theme}]} \rrbracket$  and returns all and only the atomic events happening to some sandbags and their sums. The rest proceeds the same as in (25a), and the resulted CIP in (26a) denotes a set of events consisting of some number of atoms, with sandbags as theme and numbering three. Similarly in (24a), the resulting semantics of CIP in (26a) intersects with the verbal event predicate *da* (to hit), deriving the meaning of the VP in (24a) as in (26b): a set of “three hittings” that are done to sandbags, or “hitting some sandbags three times”.

(26) a.



b.  $\llbracket \text{VP}_{(24a)} \rrbracket = \lambda e. \text{hit}'(e) \wedge e \in \{e : (\exists x_e)[\text{sandbag}'(x) \wedge \text{theme}(e, x)]\}_{At} \wedge |e| = 3$

With this, we see how the proposal addresses the central compositional puzzle of this paper, namely, how an event counting expression composes within a nominal in the object position yet nevertheless delivers a count of events.

The proposed semantics also correctly models the observation that a svCIP as such can describe or refer to three possibly mixed actions done to sandbags that are heard, as in (27a), or described as pretty, as in (27b). This is because  $\llbracket \text{shadai}_{[\text{theme}]} \rrbracket$  (28) can freely contain atomic actions and sums of actions of different kinds, e.g. hittings  $e_h$  and kickings  $e_k$ , that are done to sandbags. For this reason, the outcome of (26a) – namely (29) – is a set that contains sums of mixed atomic actions as well.

- (27) a. Zhangsan tingjian-le [san xia shadai]  
Zhangsan hear-ASP three svCl sandbag  
'Zhangsan heard three actions done to sandbags.'
- b. na [san xia shadai] hen piaoliang  
DEM three svCl sandbag very pretty  
'Those three actions done to sandbags were very pretty.'
- (28)  $At(\llbracket shadai_{[theme]} \rrbracket) = \{e_{k1}, e_{h1}, \dots, e_{k2}, e_{h2}, \dots, e_{k1} \oplus e_{k2}, e_{k1} \oplus e_{h1}, \dots\}$
- (29)  $\llbracket CIP_{(26a)} \rrbracket = \{e_{k1} \oplus e_{k2} \oplus e_{k3}, e_{k1} \oplus e_{k2} \oplus e_{h1}, e_{k1} \oplus e_{h1} \oplus e_{h2}, \dots\}$

#### 4.4 Accounting for event-structural variations

We have just seen how the meanings of (24a) and (24b) are derived. I now return to account for the other two cases in (13): (13b) and (13c) repeated in (30a) and (30b).

- (30) a. Zhangsan da-le [CIP san ge shadai]  
Zhangsan hit-ASP [ three iCl sandbags]  
'Zhangsan hit three sandbags.'
- b. Zhangsan tingjian-le [CIP san xia shadai]  
Zhangsan hear-ASP [ three svCl sandbags]  
'Zhangsan heard three actions done to some sandbags.'

Unlike in (24a), where the actions done to sandbags are understood to be hittings (the type of the event described by the matrix verb), in (30b) they are not. I account for this by supposing that the nominal complement of the svCl as well as the svCIP itself can be theta-marked.

The semantics of (30b) is in fact closely related to (30a). In both cases, the classifier phrase in the object position picks out the thematic participants of the matrix events. The VPs in both (30b) and (30a) are analyzed a verb with theta-marked CIP ( $[_{VP} V CIP_{[theme]}]$ ). The denotations of the "theta-unmarked" version of CIPs in (30b) and (30a) are given in (31), and the interpretations of those CIPs plus the theta-marking are given in (32). In particular,  $\llbracket CIP_{(30b)} \rrbracket$  is as composed in (26a) and  $\llbracket CIP_{(30a)} \rrbracket$  is based on Jiang (2012)'s original proposal for iCls, and interpretations in (32) are due to (20).

- (31) a.  $\llbracket CIP_{(30b)} \rrbracket = \lambda e_v. e \in \{(\exists x_e)[sandbag'(x) \wedge theme(e, x)]\}_{At} \wedge |e| = 3$   
b.  $\llbracket CIP_{(30a)} \rrbracket = \lambda x_e. sandbag'_{At}(x) \wedge |x| = 3$
- (32) a.  $\llbracket CIP_{(30b)[theme]} \rrbracket = \lambda e_v. (\exists e'_v)[e' \in \{(\exists x_e)[sandbag'(x) \wedge theme(e', x)]\}_{At} \wedge |e'| = 3 \wedge theme(e, e')]$

$$b. \llbracket \text{CIP}_{(30a)[\text{theme}]} \rrbracket = \lambda e_v. (\exists x_e) [\text{sandbag}'_{At}(x) \wedge |x| = 3 \wedge \text{theme}(e, x)]$$

It can easily be verified that, after (32a) and (32b) intersect with ‘hear’ and ‘hit’ respectively, the resulting VP meanings in (33) and (34) correctly model those in (30b) and (30a) respectively.

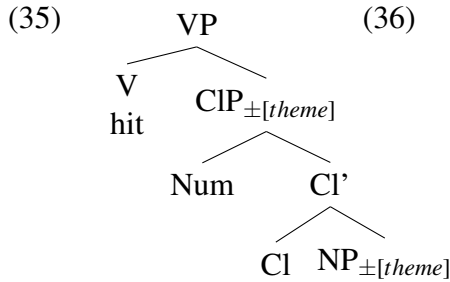
$$(33) \quad a. \llbracket \text{V}_{(30b)} \rrbracket = \lambda e_v. \text{hear}'(e)$$

$$b. \llbracket \text{VP}_{(30b)} \rrbracket = \lambda e_v. \text{hear}'(e) \wedge (\exists e'_v) [e' \in \{(\exists x_e) [\text{sandbag}'(x) \wedge \text{theme}(e', x)]\}_{At} \wedge |e'| = 3 \wedge \text{theme}(e, e')]$$

$$(34) \quad a. \llbracket \text{V}_{(30a)} \rrbracket = \lambda e_v. \text{hit}'(e)$$

$$b. \llbracket \text{VP}_{(30a)} \rrbracket = \lambda e_v. \text{hit}'(e) \wedge (\exists x_e) [\text{sandbag}'_{At}(x) \wedge |x| = 3 \wedge \text{theme}(e, x)]$$

Zooming out, we have seen four theta-assignment configurations in the same VP-structure where a verb takes a CIP as its complement. These configurations respectively correspond to the four cases with different event-structural properties summarized in (13). The four configurations come from an interaction of two theta-marking options: whether the entire CIP is theta-marked, and whether the NP complement of CI is theta-marked. The picture is schematized in (35) and (36).



(36)

CIP <sub>[theme]</sub> ?	NP <sub>[theme]</sub> ?	ex.	logical form
no	yes	(13a)	(26b)
yes	no	(13b)	(34b)
yes	yes	(13c)	(33b)
no	no	(13d)	(25b)

At this point, we have seen that this theory based on reasonable and independently motivated components is able to not only account for the central compositional puzzle, but to also make possible a simple and principled account of puzzling event-structural variation arising from what is otherwise the same VP structure. An important consequence of this theory, noted earlier, is that the theta-assignment mechanism for Mandarin Chinese must be flexible enough to permit all of the theta configurations in (36).

## 5 Conclusion

In this paper, I provided empirical facts showing that an event counting expression – numeral-svCI – forms a constituent with a following thematic nominal and surfacing as object of the verb. I showed that such a constituent – svCIP – has the syntactic properties of a canonical classifier phrase, and it expresses a count of some atomic

events related to participants picked out by the associated nominal. I proposed a formal analysis to account for this fact and related puzzles. As such, the study makes some important empirical and theoretical contributions.

Empirically, this study presents and analyzes a typologically interesting way of expressing event counts. There are some notable syntactic and semantic aspects of such expressions. Syntactically, such expressions are not adverbial modifiers of a verbal projection, but rather form a part of a nominal syntactic argument to a verb. Semantically, such expressions mention event participants along with a count of events, but leave the number of participants unspecified. This way of expressing event counts crucially differs from some other ones that in some way rely on a count of participants (see Krifka 1989; Jackendoff 1996; Nakanishi 2007 among others). Meanwhile, it is somewhat analogous to cases discussed in Krifka (1990); Moore (1994); Schein (2012), e.g. “four thousand ships passed through the lock.”, a possible connection that I leave for future research to explicate.

Theoretically, this study offers a new grammatical argument for the formal parallelism between the domains of individuals and events, where such a similarity is not reflected by grammatical analogies between NPs and VPs, but between different classifiers for events and individuals. It also crucially necessitates full thematic separation of syntactic arguments of a verb serving as its semantic argument, and to that extent, serves as a further argument for such a framework. Finally, it opens up new avenues of inquiry, in particular related to flexible theta-assignment mechanisms, at least for Mandarin Chinese.

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