Pluractionality via competition: VV in Mandarin Chinese
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Abstract. This paper provides a pragmatic mechanism for deriving pluractionality of the Mandarin VV sequence formed with certain types of verbs. We propose: (i) Syntactically, VV is an instantiation of V-(NUMERAL)-CLASSIFIER, where the second V serves as a cognate verbal classifier. (ii) Semantically, VV denotes an unspecified quantity of events, with the unit of counting being the event itself. (iii) Based on this semantic analysis, pluractionality of VV formed with certain verbs can be derived through its competition with V-one-V. Meanwhile, we address the semantics of event-internal and event-external verbal classifiers (i.e., xia vs. ci). Our analysis of cognate classifiers can be further extended to the nominal domain.

Keywords: verbal classifiers, countability, atomicity, cumulativity

1. Introduction

Verbs in Mandarin Chinese can be followed by what appears to be a reduplicative morpheme, forming a sequence that contains two instances of the same verb (henceforth VV). VV formed with certain verbs expresses event-internal pluractionality (cf. Deng 2013). For example, qiao qiao ‘knock knock’ and ti ti ‘kick kick’ in (1) convey that there are several knocks or kicks required to be performed by the addressee.

(1) a. ni qiao qiao men. you knock knock door ‘You give some knocks on the door.’
   b. ni ti ti men. you kick kick door  ‘You give some kicks to the door.’

While this seems to align with the cross-linguistic connection between pluractionality and verbal reduplication (see Newman 2012 for an overview), the structure and meaning of VV remain contested, particularly regarding (i) whether VV is formed via morphological reduplication (Li and Thompson 1981) or has a phrasal structure (Chao 1968), and (ii) whether VV expresses aspectual (Wang 1954) or quantitative meaning (Zhu 1982). Furthermore, we would like to point out that none of the previous analyses can fully account for the following puzzles.

Puzzle I: Numerals and aspectual markers can be inserted between the two Vs, such as the numeral yi ‘one’ and the aspectual marker le in (2).

(2) a. ni qiao yi qiao men. you knock one knock door ‘You give some knocks on the door.’
   b. ta qiao-le qiao men. he knock-PERF knock door ‘He gave some knocks on the door.’

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2 Given that time-adverbials in English are ambiguous between event-internal and event-external readings (i.e., event-counting vs. occasion-counting), we circumvent translations like ‘knock n times’, but make use of translational ‘give n kicks’ to unambiguously indicate event-internal readings.

3 In (2a), yi ‘one’ is unstressed and has the reading of ‘at least one’, merely indicating the existence of events. Further elaboration on the semantics of numerals will be provided in Section 4.2.
Puzzle II: Not all verbs can form VV. Activities can form VV, but statives and achievements cannot. Compare (1) with (3).

(3) a. *ta shi shi haoren.
    he be be good.person
    Int.: ‘He is a good person.’

   b. *ta dao dao lundun.
    he reach reach London
    Int.: ‘He reaches London.’

Puzzle III: Not all instances of VV express pluractionality. For example, deng deng ‘wait wait’ in (4a) and xiang xiang ‘think think’ in (4b) cannot be construed as multiple occurrences of waiting events or thinking events, but rather as a single event that extends over some time, implying a durative reading.

(4) a. ni deng deng wo.
    you wait wait me
    ‘You wait for me for a while.’

   b. ni xiang xiang zhe ge wenti.
    you think think this CL issue
    ‘You think about this issue for a while.’

Puzzle IV: It remains unclear how pluractionality is derived in VV formed with certain activities. Note that the plural interpretation is not exclusive to VV formed with semelfactive verbs. VV formed with activities like ca ‘wipe’, rou ‘rub’, mo ‘caress’, zhuai ‘tug’, dong ‘move’, bo ‘tuck’, tui ‘push’, and zhuan ‘turn’ also exhibit pluractionality, as in (5).

(5) a. ta ca-le ca zhuosi.
    he wipe-PERF wipe table
    ‘He gave the table some wipes.’

c. ta mo-le mo wo-de tou.
    he caress-PERF caress I-MOD head
    ‘He gave some caresses to my head.’

   b. ta rou-le rou houbei.
    he rub-PERF rub back
    ‘He gave his back some rubs.’

d. ta zhuai-le zhuai ziji-de xiuzi.
    he tug-PERF tug self-MOD sleeve
    ‘He gave his sleeve some tugs.’

This research aims to analyse the structure and meaning of VV and to derive pluractionality of certain VV. We first review the previous analyses (Section 2), then argue that VV is an instantiation of V-(NUMERAL)-CLASSIFIER (henceforth V-NUM-CL), with the second V serving as a cognate verbal classifier, addressing Puzzle I (Section 3). We further propose that VV denotes an unspecified quantity of events with the unit specified as the event itself (Section 4). Puzzle II and Puzzle III are attributed to cumulativity and stable atomicity of events, which are represented as functional heads in the projection of verbal classifiers. Our semantics then enables us to derive the pluractionality of VV formed with certain activities through pragmatic competition with V-one-V, thereby solving Puzzle IV (Section 5). Finally, we delve into the motivation for cognate verbal classifiers and extend our analysis to the nominal domain (Section 6).

2. Previous analyses

2.1. Structure of VV: Reduplication vs. Syntactic construction

VV has been viewed as reduplication (Li and Thompson 1981; Paris 2013) and assumed to be either stocked in the lexicon (Deng 2013) or morphologically derived (Zhu 1982). Nonetheless, the reduplication analysis encounters the challenges of Puzzle I and Puzzle II. First, the linearization problem of the inserted numerals and aspectual markers in (2) has been either left unresolved (Deng 2013) or simply ascribed to ad hoc phonological rules (Yang and Wei 2017). Second, the reduplication analysis struggles to account for the incompatibility of different verbs with VV in (3), since reduplication is not expected to be sensitive to the Aktionsart of verbs.

4 Accomplishments in Mandarin Chinese are expressed by phrases rather than simplex verbs (Huang 2014). Given that VV typically applies to simplex verbs, our discussion will be focused on activities, achievements, and statives.
An alternative approach treats VV as a syntactic construction, with the first instance of V being a verb and the second, a verbal classifier (Fan 1964; Chao 1968; Xiong 2016). The syntactic approach essentially analyses VV as an instantiation of V-(NUM)-CL. The parallels between VV and V-NUM-CL will be discussed in Section 3.1. In Mandarin, verbal classifiers encode units for counting in the domain of events. For instance, the verbal classifier xia in (6a) provides a unit for counting kicks, comparable to the nominal classifier ge for pears in (6b).

(6) a. ti san xia
   kick three CL
   ‘give three kicks’
   b. san ge li
   three CL pear
   ‘three pears’

Within the domain of events, there exists a distinction between events and occasions, resulting in two levels of counting: event-internal and event-external (Cusic 1981). In English, this distinction manifests as scopal difference of time-adverbials (Andrews 1983; Cinque 1999), as illustrated in (7). In Mandarin, this distinction is lexically encoded in two types of verbal classifiers (Deng 2013; Donazzan 2013; Zhang 2017; Liao 2018). As demonstrated by (8), xia provides a counting unit for events, whereas ci provides a counting unit for occasions. We will revisit this issue in Section 3.1 and 4.1.

(7) a. He kicked the door three times four times. (three events, four occasions)
   b. Four times, he kicked the door three times.

(8) a. ta ti-le si ci men, mei ci ti san xia.
   he kick-PERF four CL_occ door each CL_occ kick three CLEvt
   ‘He kicked the door on four occasions, and on each occasion he gave three kicks.’
   b. ‘ta ti-le si xia men, mei xia ti san ci.
   he kick-PERF four CLEvt door each CLevt kick three CL_occ
   Int.: ‘He kicked the door on four occasions, and on each occasion he gave three kicks.’

The syntactic approach holds two advantages over the reduplication analysis. First, it resolves the insertion issue of numerals and aspectual markers (Puzzle I) by treating the second V as a verbal classifier. Second, it may provide a potential explanation for the compatibility pattern of VV with different verbs (Puzzle II) through the s-selection of a functional head. The details of the explanation will be further explored in Section 4.2.  

2.2. Meaning of VV: Aspect vs. Quantity

Regarding the meaning of VV, it has been suggested that VV conveys particular aspectual information such as delimitativeness (Li and Thompson 1981), short duration (Wang 1954), or tentativeness (Chao 1968; Yang and Wei 2017). According to the delimitativeness view, events conveyed by VV are either low in frequency or short in temporal length, whereas the short duration view emphasises only the latter. However, the denotation of VV is not necessarily tied to low frequency or short duration. As shown by (9) and (10), ca ca ‘wipe wipe’ and xiang xiang ‘think think’ can occur in contexts where the wiping events and the thinking events take a considerable amount of time. As for tentativeness, it is in fact a context-dependent
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reading of VV observed only in irrealis contexts. For instance, VV in (5) does not exhibit tentativeness. Even in irrealis contexts, (9) and (10) demonstrate that the events denoted by VV can be sufficient, certain, and decisive, contrary to the notion of tentativeness.

(9) 

diban zheme zang, dei ca yi ge xingqi, ni haohao ca ca. 

floor this dirty require wipe one CL week you sufficiently wipe wipe
‘A floor this dirty needs a week of wiping. Give it a sufficient number of wipes.’

(10) ni zixi xiang xiang zhe ge wenti, bu xiang qingchu jiu bie zou. 

you carefully think think this CL issue not think clearly then not leave
‘You think about this issue thoroughly. Otherwise, you won’t be allowed to leave.’

This paper will entertain an alternative view, the quantity-based approach, which contends that the core meaning of VV is centred around counting/quantity rather than temporal properties of events. Within this approach, various proposals have been made regarding the meaning of VV, including conveying small quantity in occurrences (Zhu 1982), unspecified quantity (Li 1964), vague quantity (Cheng 1988), and event plurality (Deng 2013). For the small quantity view, as we have seen in (9), the denotation of VV is not necessarily small in quantity. The other three views acknowledge the pluractionality of certain VV like qiao qiao ‘knock knock’. To support this point, we present three pieces of evidence: (i) such VV can be associated with dou that introduces universal quantification (cf. Lee 1986; Lin 1998; a.o.), as in (11); (ii) such VV can be referred back to by plural definites instead of singular definites, as in (12); (iii) such VV is unacceptable in singular-event scenarios, as shown by (13).

(11) ta qiao-le qiao men. dou qiao-zai-le boli-shang. 

he knock-PERF knock door all knock-on-PERF glass-LOC
‘He gave some knocks on the door, all of which were on the glass panel.’

(12) ta qiao-le qiao men. ta qiao-de na [ji / #yi] xia hen qing. 

he knock-PERF knock door he knock-MOD the several one CL evt very gentle
‘He gave some knocks on the door. Those knocks were very gentle.’

(13) #baochi anjing. buyao qiao hao ji xia men, qiao qiao men. 

keep quiet don’t knock very several CL evt door knock knock door
Int.: ‘Keep quiet. Don’t give multiple knocks on the door; give one knock on the door.’

Nevertheless, the quantity-based approach leaves Puzzle III and IV unresolved, namely, why deng deng ‘wait wait’ does not exhibit pluractionality, and why qiao qiao ‘knock knock’ does.

To summarise, for the structure of VV, the syntactic approach holds advantages over the reduction analysis; for the meaning of VV, the quantity-based approach proves to be more solid than the aspect-based approach. On the basis of the syntactic approach and the quantity-based approach, we will further address the four puzzles introduced in Section 1. Now let us first elaborate on the syntactic structure of VV.

3. Syntax of VV

3.1. VV: V-(NUM)-CL under the guise of reduplication

As previously noted in Section 2.1, treating VV as reduplication falls short when addressing Puzzle I and II. More evidence from Mandarin and the earlier stages of its development suggests that VV has an internal syntactic structure.
First, more than one word is allowed to occur in between the two Vs, including the numeral yi ‘one’, the perfective marker le, and the resultative morpheme shang.

(14) ta dan-le yi dan shen-shang-de chentu.
    he whisk-PERF one whisk body-LOC-MOD dust
    ‘He gave some whisks to remove the dust from his body.’

(15) fanshi ren-de dongxi, beiijingren dou neng wan-shang yi wan.
    all human-MOD thing Beijinger all can play-RESULT one play
    ‘For every handicraft, Beijingers can play with it for a while.’

Second, while the numeral between VV is limited to yi ‘one’ in Mandarin, numeral-insertion is rather productive in late Medieval and early Modern Chinese. 7

(16) jiang mashaoer qu na menxian-shang qiao san qiao.
    take spoon go that threshold-LOC knock three knock
    ‘Use the spoon to give three knocks on that threshold.’
    (Taohuany po fa jia Zhougong, Drama, 1200s A.D.)

Numeral insertion suggests that the second V of VV is a verbal classifier. We would like to present additional evidence to demonstrate that VV is actually an instantiation of V-(NUM)-CL.

First, the second V in VV exhibits a complementary distribution with NUM-CL.

(17) a. ni qiao (yi) qiao men.  
    you knock one knock door
    ‘You give some knocks on the door.’

b. ni qiao (yi) xia men.  
    you knock one CLevt door
    ‘You give some knocks on the door.’

Second, V-(one)-V and V-(one)-CL share the same licensing condition for yi-ellipsis. When the numeral yi ‘one’ is not focused, it solely conveys the existence of events (see Section 4.2), and thus can be omitted without changing the meaning.

(18) a. ni qiao (yi) qiao men.  
    you knock one knock door
    ‘You give some knocks on the door.’

b. ni qiao (yi) xia men.  
    you knock one CLevt door
    ‘You give some knocks on the door.’

Third, both VV and V-(NUM)-CL allow for le-insertion, and the aspectual marker le cannot be attached to the whole construction, as shown in (19) and (20). The position of le suggests that only the first V of VV occupies the V head.

(19) a. ta qiao-le qiao men.  
    he knock-PERF knock door
    ‘He gave some knocks on the door.’

b. *ta qiao qiao-le men.  
    he knock knock-PERF door
    Int.: ‘He gave some knocks on the door.’

(20) a. ta qiao-le xia men.  
    he knock-PERF CLevt door
    ‘He gave some knocks on the door.’

b. *ta qiao xia-le men.  
    he knock CLevt-PERF door
    Int.: ‘He gave some knocks on the door.’

Fourth, the second V of VV aligns with the event-internal classifier xia, not the event-external classifier ci (see Section 2.1). As (21) illustrates, VV conveys event counting instead of occasion counting.

7 In Mandarin, the numeral yi ‘one’ between VV does not have alternatives. Consequently, it cannot be focused or stressed, and it only gets the at least reading. By contrast, in late Medieval and early Modern Chinese, numerals between VV have alternatives and thus can get the exactly reading. This issue will be discussed in Section 4.2.
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(21) a. ta qiao-le qiao men, mei {*ci / xia} dou hen qing.
   he knock-PERF knock door each CL_occ CL_ext all very gentle
   ‘He gave some knocks on the door, and each knock was very gentle.’

   b. ta qiao-le ji xia men, mei {*ci / xia} dou hen qing.
   he knock-PERF several CL_ext door each CL_occ CL_ext all very gentle
   ‘He gave several knocks on the door, and each knock was very gentle.’

Fifth, VV and V-NUM-CL_ext exhibit a similar pattern in their compatibility with different verbs, as demonstrated by our investigation of 170 verbs summarised in Table 1. Specifically, statives are not compatible with VV or V-NUM-CL. Achievements are rejected by VV or V-NUM-CL_ext yet compatible with V-NUM-CL_occ. Activities can be divided into two types: Activities I (qiao ‘knock’) can occur in VV and V-NUM-CL, and VV formed with Activities I is pluractional. Activities II (deng ‘wait’) can be found in VV and V-one-CL_ext but not V-three-CL_ext, and VV formed with Activities II is not pluractional.

<table>
<thead>
<tr>
<th>Class</th>
<th>Example</th>
<th>VV</th>
<th>V-one-CL_ext</th>
<th>V-three-CL_ext</th>
<th>V-NUM-CL_occ</th>
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<tbody>
<tr>
<td>Statives</td>
<td>shi ‘be’</td>
<td>*shi</td>
<td>*shi yi xia</td>
<td>*shi san xia</td>
<td>*shi san ci</td>
</tr>
<tr>
<td>Achievements</td>
<td>dao ‘reach’</td>
<td>*dao dao</td>
<td>*dao yi xia</td>
<td>*dao san xia</td>
<td>dao san ci</td>
</tr>
<tr>
<td>Activities I</td>
<td>qiao ‘knock’</td>
<td>qiao</td>
<td>qiao yi xia</td>
<td>qiao san xia</td>
<td>qiao san ci</td>
</tr>
<tr>
<td>Activities II</td>
<td>deng ‘wait’</td>
<td>deng</td>
<td>deng yi xia</td>
<td>deng san xia</td>
<td>deng san ci</td>
</tr>
</tbody>
</table>

Table 1: Compatibility of counting constructions with verbs

Together, the evidence supports our claim that VV is in fact V-one-CL_ext with an omitted unfocused yi ‘one’. The second V of VV is a cognate verbal classifier providing a counting unit for events, akin to the event-internal verbal classifier xia.

3.2. NUM-CL is an adjunct

In line with Huang, Li, and Li’s (2009) adjunct-based analysis, we argue that NUM-CL_ext (including NUM-V) in V-NUM-CL_ext is an adjunct rather than an argument of the verb. First, NUM-CL_ext is optional.

(22) a. ni qiao (yi qiao) men.  "You knock one CLKNOCK door"
   'You give some knocks on the door.'

Second, NUM-CL_ext can compose with predicates whose argument slots are saturated, such as ditransitive verbs with both direct and indirect objects, suggesting that NUM-CL_ext is not an argument of the verb.

(23) a. ni jiao (yi jiao) wo shuxue.  "You teach one CL_TEACH me math"
   'You teach me math a bit.'

Third, in contrast with indefinite arguments, NUM-CL_ext lacks the de re reading, indicating its adjunct status (Landman 2004, 2006). In (24a), the indefinite object can take either the narrow
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or the wide scope, while in (24b), NUM-CL_{evt} can only take the narrow scope.\(^8\)

(24) a. mei ge ren dou xiang qu yi ge Beijing guniang.
   `Everyone wants to marry a girl from Beijing.'
   `There is a girl from Beijing who everyone wants to marry.'

b. mei ge ren dou xiang qiao yi xia men.
   `Everyone wants to give a knock on the door.'
   `There is a knock which everyone wants to give on the door.'

3.3. Structuring V-NUM-CL

We have argued that VV is an instantiation of V-(NUM)-CL_{evt}, and NUM-CL_{evt} is an adjunct of V. Since NUM-CL_{evt} encodes event counting, we assume that NUM-CL_{evt} is situated structurally inside vP (cf. Cinque 1999; Zhang 2017). In the spirit of Borer (2005), we further propose that NUM-CL is represented as Quan(tity)P, as (25) illustrates.

(25)

\[
\begin{align*}
\text{AspP} & \quad \text{AspP} \\
& \quad \text{AspP} \\
\quad \text{Asp} & \quad \text{vP} \\
\quad \text{vP} & \quad \text{vP} \\
\quad \text{QuanP} & \quad \text{QuanP} \\
\quad \text{Quan} & \quad \text{Quan} \\
\quad \text{Div}_{\text{min/max}} & \quad \text{Div}_{\text{min/max}} \\
\quad \text{Div} & \quad \text{Div} \\
\quad \sqrt{xia} & \quad \sqrt{qiao} \\
\quad \sqrt{xia} & \quad \sqrt{qiao} \\
\end{align*}
\]

QuanP is an adjunct to the verb. Internally, QuanP is headed by Quan, which takes a numeral as its specifier and a verbal classifier Div(ision)\(^{\text{min/max}}\) as its complement.\(^9\) For the linear order, we follow Huang et al.’s (2009) analysis and treat le as an affix at the Asp head; the verb moves up to v, eventually landing in the Asp head. This gives us the desired order of V-NUM-CL_{evt} as well as the linear adjacency of the verb and the aspectual marker le, thereby resolving the

\(^8\) Manfred Krifka (p.c.) suggests that the observed absence of the de re reading for NUM-CL_{evt} could be attributed to the inherent difficulty in identifying specific knocking events. Yet, this does not seem to be the case in Mandarin, as events can be identifiable, particularly with the use of demonstratives zhe ‘this’ and na ‘that’.

(i) mei ge ren dou xiang qiao na yi xia.
   `Everyone wants to give that knock.'

\(^9\) Following Chomsky (1995), a functional category can be both maximal and minimal. Hence, it is reasonable to postulate that Div^{\text{min/max}} is a complex head which is simultaneously maximal and minimal.
As for verbs and verbal classifiers, we adopt core assumptions from Distributed Morphology (Marantz 1997, 2007; Embick and Marantz 2008; a.o.) and assume that terminal nodes can be decomposed into roots and categorizers. A categorizer provides a categorial label for the root that it combines with, and the root carries lexical information. In this way, a verb and a verbal classifier are syntactically isomorphic, sharing the same template (categorizer + root). A root, e.g., $\sqrt{\text{qiao}}$ ‘knock’, can merge with the verbal categorizer (v) or the categorizer for classifiers (Div). This provides a feasible mechanism for deriving the identical lexical form of the cognate verbal classifier and the verb. The motivation for merging the same root with v and Div will be explored in Section 6.

4. Semantics of V-NUM-CL

4.1. Ontology of events

Before delving into the semantics of V-NUM-CL, let us lay out our background assumptions about events and verbs. First, following the general assumption that a verb denotes a set of events (Parsons 1990; Krifka 1992; a.o.), and Krifka’s (1989) idea that there is a semi-lattice structure in the domain of events, we assume that a verb denotes a structured set of events, as schematised in (26). That is, the denotation of a verb may include atomic events and complex events. Atomic events have no sub-events, and complex events are sums of atomic events.11

\[
\begin{align*}
e_1 \oplus e_2 \oplus e_3 \\
e_1 \oplus e_2 \\
e_1 \\
e_2 \\
e_3
\end{align*}
\]

Second, verbs with different lexical aspects can be characterised by different types of event sets, as in (27). Statives like $\text{shi}$ ‘be’ denote a set of states (notated as $s$) rather than events (notated as $e$). Achievements like $\text{dao}$ ‘reach’ denote a set of atomic events. Given that achievements express a single punctual event, two achievement events cannot be cross-temporally identical when they count as the same event for the purpose of enumerating events (Lund 2021). Therefore, there are no complex achievement events. Activities like $\text{qiao}$ ‘knock’ and $\text{deng}$ ‘wait’ denote a set of events that include both atomic events and complex events, since activity events can be cross-temporally identical.

\[
\begin{align*}
\text{[shi]} & = \{s_{be1}, s_{be2}, s_{be3}, \ldots \} \\
\text{[dao]} & = \{e_{reach1}, e_{reach2}, e_{reach3}, \ldots \} \\
\text{[qiao]} & = \{e_{knock1}, e_{knock2}, \ldots, e_{knock1} \oplus e_{knock2}, \ldots \} \\
\text{[deng]} & = \{e_{wait1}, e_{wait2}, \ldots, e_{wait1} \oplus e_{wait2}, \ldots \}
\end{align*}
\]

Third, occasions, at least in Cusic’s (1981) sense, can be characterised as groups of events with

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10 We do not treat the verbal classifier as a head in the Extended Projection of V, contra Zhang (2017). Empirically, we have argued that NUM-CL$_{evt}$ is an adjunct in Section 3.2. Technically, treating the verbal classifier as a head would block the V-to-v-to-Asp movement, thus failing to account for the linear adjacency of V and le, as in (19) and (20), and the linear order of V-NUM-CL$_{evt}$-O, as in (21b).

11 We take verbs as born plural. Otherwise, this could be manipulated with Link’s (1983) pluralising operator $\ast$. 
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the group forming operator \( \uparrow \) (Link 1984; Landman 1989a, b). A group of events is an atom that contains at least one atomic event or one complex event.

(28) Group of events: \( \uparrow (e), \uparrow (e_1 \oplus e_2), \ldots \)

The widely recognized distinction between event-internal and event-external, which is lexically manifested in Mandarin verbal classifiers (Section 2.1), can now be recast in terms of events and groups of events. Specifically, \( xia (\text{CL}_{\text{evt}}) \) provides a counting unit for events, whereas \( ci (\text{CL}_{\text{oocc}}) \) does so for groups of events.

4.2. Composition of V-NUM-CL

In this section, we deal with the semantic composition of V-NUM-CL\text{evt}, taking \textit{qiao san xia} and \textit{qiao san qiao} in (29) as examples.

(29) a. ni \textit{qiao san xia} men.
You knock three \text{CL}_{\text{evt}} door
‘You give three knocks on the door.’

 b. jiang mashaoer qu na menxian-shang \textit{qiao san qiao}.
take spoon go that threshold-LOC knock three
‘Use the spoon to give three knocks on that threshold.’
(\textit{Taohuang po fa jia Zhougong}, Drama, 1200s A.D.)

Adopting Neo-Davidsonian event semantics (Parsons 1990; Carlson 1984; a.o.), we treat verbs as one-place predicates of events. They are combined with the thematic arguments via predicate modification, with all arguments introduced by thematic role heads. (30) illustrates our proposal of the semantic composition of V-NUM-CL\text{evt}.

(30)

\[ \begin{align*}
\lambda e.\text{knock}(e) \land \#e \geq 3 & \\
\lambda e.\text{knock}(e) & \\
\lambda e.\text{xia}/\text{knock}(e) \land \#e \geq 3 & \\
\lambda e.\text{xia}/\text{knock}(e) & \\
\lambda P.\lambda e.\text{xia}/\text{knock}(e) \land \text{SAT}(P)(e) & \\
\lambda P.\lambda e.\text{xia}/\text{knock}(e) & \\
\lambda P.\lambda e.\text{xia}/\text{knock}(e) & \\
\lambda P : \text{CUM}(P).\lambda e.\text{xia}/\text{knock}(e) & \\
\lambda P.\lambda e.\text{xia}/\text{knock}(e) & \\
\lambda P.\lambda e.\text{xia}/\text{knock}(e) & \\
\end{align*} \]

12 See also Wagiel (2018) for a mereotopological analysis of groups, which defines a group as a cluster, namely, a plurality of transitively connected entities.
4.2.1. Cumulativity and Puzzle II

Given the decomposition of a verb into a root and a categorizer, we assume, for simplicity, that the root denotes a set of events, and the verbal categorizer introduces an identity function. As for verbal classifiers, it is worth noting that they are grammaticalized out of verbs (Liu 1959), and especially, cognate verbal classifiers share the same lexical form as verbs. Hence, we put forward that verbal classifiers share the same semantic type as verbs. More precisely, the root of a verbal classifier also denotes a set of events, and the categorizer Div selects a certain type of roots, in light of the compatibility pattern of VV and V-NUM-CL in Table 2 (Puzzle II).

<table>
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</tr>
<tr>
<td>Achievements</td>
<td>dao ‘reach’</td>
<td></td>
<td></td>
<td>+</td>
</tr>
<tr>
<td>Activities</td>
<td>qiao ‘knock’, deng ‘wait’</td>
<td>+</td>
<td></td>
<td>+</td>
</tr>
</tbody>
</table>

Table 2: Compatibility of counting constructions with verbs (extracted from Table 1)

To account for the compatibility pattern, we propose that the categorizer Div s-selects roots via the cumulativity presupposition (cf. Scha 1981; Schein 1986), as in (31). The cumulativity presupposition requires the input of Div to contain complex events (i.e., divisible events).

\[
\text{Cumulativity of events} \quad \text{CUM}(P) \overset{\text{def}}{=} \forall e[P(e) \rightarrow \forall e'[P(e') \rightarrow P(e \oplus e')]]
\]

Essentially, the categorizer Div determines what types of roots can form a verbal classifier, which further results in the compatibility of VV and V-NUM-CL with different verbs. Given the cumulativity presupposition, Div exclusively selects activity roots, as only activity roots have complex events in their denotations. Specifically, only activity roots (e.g., √qiao ‘knock’, √deng ‘wait’) can form verbal classifiers; stative roots like √shi ‘be’, denoting a set of states rather than events, do not match the type of the input of Div; achievement roots like √dao ‘reach’ denote a set of events consisting only of atomic events, and thus fail to meet the cumulativity presupposition. Consequently, only activity roots can form VV.

One special case of activity roots selected by Div is √xia. In Ancient Chinese, the verb xia ‘move down’ denotes a set of events with a downward trajectory, as in (32a). Then, it undergoes semantic bleaching and is used as a dedicated verbal classifier. Since the verbal classifier xia provides a natural counting unit for all activity events, it is reasonable to assume that the denotation of bleached √xia is the union of all the activity roots, as in (32b).\(^{13}\)

\[
\begin{align*}
\text{(verb xia)} & \quad \sqrt{xia} = \{e_{\text{down}}1, e_{\text{down}}2, e_{\text{down}}1 \oplus e_{\text{down}}2, \ldots\} \\
\text{(classifier xia)} & \quad \sqrt{xia_{\text{bleached}}} = \{e_{\text{activity}}1, e_{\text{activity}}2, e_{\text{activity}}1 \oplus e_{\text{activity}}2, \ldots\} \\
& \quad = \{e_{\text{knock}}1, e_{\text{knock}}2, e_{\text{knock}}1 \oplus e_{\text{knock}}2, \ldots, e_{\text{wait}}1, e_{\text{wait}}2, e_{\text{wait}}1 \oplus e_{\text{wait}}2, \ldots\}
\end{align*}
\]

Now we can explain why V-one-CL_{evt} (i.e., V-one-xia) only permits activities to serve as its main verb. In our analysis, one-CL_{evt} and V are combined via predicate modification, as will be demonstrated in Section 4.2.2. Since the denotation of √xia_{bleached} includes only activity events, and its intersection with the set of events denoted by V cannot be empty, the denotation of V must include activity events. As a result, V must be activities.

\(^{13}\) The denotation of √xia_{bleached} in (32b) satisfies the cumulativity presupposition in (31), as the sum operator only applies to entities of the same kind and there are no complex events like $e_{\text{knock}} \oplus e_{\text{wait}}$. 

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Note that there are no achievement events in the denotation of \( \sqrt{xia} \). According to the cumulativity presupposition in (31), the input of Div must contain members that are summable. Since achievement events are not summable (Section 4.1), they are excluded from the denotation of \( \sqrt{xia} \). Hence, for V-one-xia, V cannot be achievements.

As for V\(-\text{NUM-CL}_{\text{acc}}\) (i.e., V\(-\text{NUM-ci}\)), the denotation of the verbal classifier ci is assumed to be as follows (cf. Liao 2018; Li 2019).

\[
(33) \quad \left[ \sqrt{ci} \right] = \uparrow (e_{\text{knock}1}) \uparrow (e_{\text{knock}2}) \uparrow (e_{\text{knock1}} \oplus e_{\text{knock2}}) \uparrow (e_{\text{knock1}} \uparrow (e_{\text{knock2}}) \uparrow (e_{\text{wait}1}) \uparrow (e_{\text{wait2}}) \uparrow (e_{\text{wait1}} \oplus e_{\text{wait2}}) \uparrow (e_{\text{wait1}} \uparrow (e_{\text{wait2}}) \uparrow (e_{\text{reach1}}) \uparrow (e_{\text{reach2}}) \uparrow (e_{\text{reach1}}) \oplus \uparrow (e_{\text{reach2}}) \ldots)
\]

The denotation of ci differs from that of xia in two aspects. First, ci targets groups of events (Section 2.1), so \( \sqrt{ci} \) denotes a set of groups of events. Before merging with \text{NUM-ci}, V is first combined with the group forming operator \( \uparrow \), rendering a set of groups of events. Since the intersection of \text{NUM-ci} and \( \uparrow V \) is a non-empty set, V cannot be statives, which do not match the type of \text{NUM-ci}. Second, the denotation of \( \sqrt{ci} \) contains sums of groups of achievement events. As discussed in Section 4.1, there are no sums of achievement events within one occasion. However, among multiple occasions, there do exist sums of groupified achievement events like \( \uparrow (e_{\text{reach1}}) \oplus \uparrow (e_{\text{reach2}}) \). This is why achievements, in addition to activities, can serve as the main verb in V\(-\text{NUM-ci}\).

4.2.2. Stable atomicity and Puzzle III

Let us proceed to the other functional head in (30), Quan, which takes the output of Div, namely, verbal classifiers formed with activity roots. Quan is related to the differences between the two types of activities with respect to the interpretation of VV and the restriction on numerals, as illustrated in Table 3. First, VV formed with Activities I (qiao ‘knock’) exhibits pluractionality, while VV formed with Activities II (deng ‘wait’) does not (Puzzle III). Second, Activities I are compatible with any numerals in V\(-\text{NUM-CL}_{\text{evt}}\), whereas for Activities II, the numeral is limited to yi ‘one’.

<table>
<thead>
<tr>
<th>Class</th>
<th>Example</th>
<th>VV</th>
<th>V(-\text{one-CL}_{\text{evt}})</th>
<th>V(-\text{three-CL}_{\text{evt}})</th>
<th>V(-\text{NUM-CL}_{\text{acc}})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities I</td>
<td>qiao ‘knock’</td>
<td>+pluractional</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Activities II</td>
<td>deng ‘wait’</td>
<td>+notpluractional</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
</tbody>
</table>

Table 3: Compatibility of counting constructions with activities (extracted from Table 1)

To account for the pattern above, we propose two flavours of Quan that diverge in terms of stable atomicity, that is, whether an atomic event remains atomic across contexts (cf. Chierchia 2010). As defined by (34) and (35), Quan\(_1\) yields a set of events with members composed of stable atoms, whereas Quan\(_2\) yields a set of events with members composed of unstable atoms.

\[
(34) \quad \text{Stable atomicity of events}
\]

\[
\text{SAT}(P)(e) \equiv \exists e'[e' \subseteq e \land P(e') \land \forall c[\neg \exists e'' \text{ in } c[e'' \sqsubseteq e']]]
\]

\[
(35) \ a. \ [\text{Quan}_1] = \lambda P . \lambda e . P(e) \land \text{SAT}(P)(e)
\]

\[
\text{b. } [\text{Quan}_2] = \lambda P . \lambda e . P(e) \land \neg \text{SAT}(P)(e)
\]

14 The same pattern is also observed in V\(-\text{NUM-V}\) in early Modern Chinese. V\(-\text{NUM-V}\) formed with Activities I allows for any numerals, while V\(-\text{NUM-V}\) formed with Activities II is only compatible with yi ‘one’.
For an intuitive illustration, consider knocking events (stable atoms) versus waiting events (unstable atoms). An atomic knocking event is stable in the sense that in different contexts it remains minimal and has no subevent that can be considered as a knocking event. By contrast, atomic waiting events vary across different contexts. For instance, imagine a scenario where John waited for Mary for an hour, then went to the restroom, and later returned to wait for her for an additional hour. In this case, John’s waiting can be construed either as a single waiting event or as two distinct waiting events.

Events with stable atoms can be precisely counted, whereas events with unstable atoms are too vaguely specified to be counted. In our analysis, the difference in respect of the counting result can be represented as a requirement of Quan on the numerals in its specifier position. Following Horn (1972), Gazdar (1979), Levinson (1983), and others, we adopt an at least semantics for numerals, as in (36).\(^{15}\) Consequently, Quan\(_1\) allows for precise counting results and thus can take any numerals as its specifier; Quan\(_2\) confines its specifier to the unfocused yi ‘one’ with an at least reading, which merely indicates the existence of events.

\[(36)\] a. \([yi \; \text{‘one’}] = \lambda e.\{e' \mid e' \leq \text{atom} \; e\}\) \(\geq 1 = \lambda e.\#e \geq 1\)

b. \([san \; \text{‘three’}] = \lambda e.\{e' \mid e' \leq \text{atom} \; e\}\) \(\geq 3 = \lambda e.\#e \geq 3\)

Note that we analyse NUM-CL\(_{evt}\), as well as numerals, as interjective modifiers rather than quantifiers. The evidence comes from two facts. First, there is no observation of quantifier raising of NUM-CL\(_{evt}\); see (24). Second, when combined with other plurals, NUM-CL\(_{evt}\) gets a scopeless, cumulative reading (cf. Landman 2000, 2004, 2006), as shown by (37).

\[(37)\] a. ta qiao-le liang shan men si xia. b. ta ti-le liang ge ren si xia.

   ‘He gave a total of 4 knocks on 2 doors.’

‘He gave a total of 4 kicks to 2 people.’

Now we are equipped to explain the differences between two types of activities. For V-NUM-CL\(_{evt}\) (i.e., V-NUM-xia), recall that the denotation of \(\sqrt{xia}\)bleached contains all activity events and Div does not alter its input. When xia merges with Quan\(_1\), the output is restricted to a set containing only the events composed of stable atoms, which is the union set of the events denoted by Activities I. In this case, the verb in V-NUM-CL\(_{evt}\) can only be Activities I. Since Quan\(_1\) can take any numerals as its specifier, V-NUM-CL\(_{evt}\) formed with Activities I does not impose any constraints on numerals.

\[(38)\] Illustration of qiao sanF xia ‘knock three CL\(_{evt}\)”\(^{16}\)

a. \([\text{Div}]([\sqrt{xia}]) = \{e_{\text{knock}}1, e_{\text{knock}}2, e_{\text{knock}}1 \oplus e_{\text{knock}}2, \ldots, e_{\text{wait}}1, e_{\text{wait}}2, e_{\text{wait}}1 \oplus e_{\text{wait}}2, \ldots\}\)

b. \([\text{Quan}_1([\text{Div}]([\sqrt{xia}]))] = \{e_{\text{knock}}1, e_{\text{knock}}2, e_{\text{knock}}1 \oplus e_{\text{knock}}2, \ldots\}\)

c. \([\text{sanF}][\text{Quan}_1([\text{Div}]([\sqrt{xia}]))] = \{e_{\text{knock}}1 \oplus e_{\text{knock}}2 \oplus e_{\text{knock}}3, \ldots\}\)

d. \([\text{qiao}][\text{sanF}][\text{Quan}_1([\text{Div}]([\sqrt{xia}]))] = \{e_{\text{knock}}1 \oplus e_{\text{knock}}2 \oplus e_{\text{knock}}3, \ldots\}\)

When xia merges with Quan\(_2\), the output is restricted to a set of events composed of unstable atoms, which is the union set of the events denoted by Activities II. In this case, the verb in V-NUM-CL\(_{evt}\) can only be Activities II. Given that Quan\(_2\) only allows for the unfocused yi

\(^{15}\) See Bylinina and Nouwen (2020) for an overview of numeral semantics.

\(^{16}\) Numerals with the subscript F are focused and have an exactly reading, whereas numerals with the subscript UF are unfocused and have an at least reading. See Section 4.2.3 for details.
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‘one’ to be its specifier, the numeral in V-NUM-CL evt formed with Activities II is limited to the unfocused yi ‘one’.

(39) Illustration of deng yiUF xia ‘wait one CL evt’
   a. \([\text{Div}([\sqrt{\text{xia}}]) = \{e_{\text{knock}1}, e_{\text{knock}2}, e_{\text{knock}1} \oplus e_{\text{knock}2}, \ldots, e_{\text{wait}1}, e_{\text{wait}2}, \ldots\}\]
   b. \([\text{Quan}_1([\text{Div}([\sqrt{\text{xia}}])]) = \{e_{\text{wait}1}, e_{\text{wait}2}, e_{\text{wait}1} \oplus e_{\text{wait}2}, \ldots\}\]
   c. \((\text{yiUF})](\text{Quan}_2([\text{Div}([\sqrt{\text{xia}}])])) = \{e_{\text{wait}1}, e_{\text{wait}2}, e_{\text{wait}1} \oplus e_{\text{wait}2}, \ldots\}\]
   d. \((\text{deng})](\text{yiUF}](\text{Quan}_2([\text{Div}([\sqrt{\text{xia}}])])) = \{e_{\text{wait}1}, e_{\text{wait}2}, e_{\text{wait}1} \oplus e_{\text{wait}2}, \ldots\}\]

It is worth mentioning that for V-NUM-CL occ formed with Activities II, the numeral is not limited to the unfocused yi ‘one’. For example, deng san ci ‘wait three CL occ’ is grammatical, denoting three groups of waiting events. This is because groups possess the property of stable atomicity and can be precisely counted (Landman 1989a, b; Snyder and Shapiro 2022; a.o.).

As for VV, namely, V-(oneUF)-V, its pluractionality (Puzzle III) also hinges on the stable atomicity of events. In brief, with Activities I, V-(oneUF)-V denotes a set of events composed of stable atoms, and competes with the singular alternative V-oneF-V, resulting in pluractionality. With Activities II, V-(oneUF)-V denotes a set of events composed of unstable atoms that cannot be counted, and thus simply indicates the existence of events.\textsuperscript{17} Consequently, VV formed with Activities II lacks singular alternatives like V-oneF-V for competition and does not exhibit pluractionality. The specifics of pragmatic competition will be further explored in Section 5.

(40) Illustration of qiao yiUF qiao ‘knock one CL KNOCK’
   a. \([\text{Div}([\sqrt{\text{qiao}}]) = \{e_{\text{knock}1}, e_{\text{knock}2}, e_{\text{knock}1} \oplus e_{\text{knock}2}, \ldots\}\]
   b. \([\text{Quan}_1([\text{Div}([\sqrt{\text{qiao}}])]) = \{e_{\text{knock}1}, e_{\text{knock}2}, e_{\text{knock}1} \oplus e_{\text{knock}2}, \ldots\}\]
   c. \((\text{yiUF})](\text{Quan}_1([\text{Div}([\sqrt{\text{qiao}}])])) = \{e_{\text{knock}1}, e_{\text{knock}2}, e_{\text{knock}1} \oplus e_{\text{knock}2}, \ldots\}\]
   d. \((\text{qiao})](\text{yiUF}](\text{Quan}_1([\text{Div}([\sqrt{\text{qiao}}])])) = \{e_{\text{knock}1}, e_{\text{knock}2}, e_{\text{knock}1} \oplus e_{\text{knock}2}, \ldots\}\]

(41) Illustration of deng yiUF deng ‘wait one CL WAIT’
   a. \([\text{Div}([\sqrt{\text{deng}}]) = \{e_{\text{wait}1}, e_{\text{wait}2}, e_{\text{wait}1} \oplus e_{\text{wait}2}, \ldots\}\]
   b. \([\text{Quan}_2([\text{Div}([\sqrt{\text{deng}}])]) = \{e_{\text{wait}1}, e_{\text{wait}2}, e_{\text{wait}1} \oplus e_{\text{wait}2}, \ldots\}\]
   c. \((\text{yiUF})](\text{Quan}_2([\text{Div}([\sqrt{\text{deng}}])])) = \{e_{\text{wait}1}, e_{\text{wait}2}, e_{\text{wait}1} \oplus e_{\text{wait}2}, \ldots\}\]
   d. \((\text{deng})](\text{yiUF}](\text{Quan}_2([\text{Div}([\sqrt{\text{deng}}])])) = \{e_{\text{wait}1}, e_{\text{wait}2}, e_{\text{wait}1} \oplus e_{\text{wait}2}, \ldots\}\]

4.2.3. Denotation of V-NUM-CL

Eventually, in our analysis, V-NUM-CL evt denotes a certain number of events, where the counting unit is CL and the counting result is NUM. The verbal classifier can be either a general classifier that encodes the natural unit, or a cognate classifier taking the event itself as the unit.

(42) a. \([\text{knock one xia}] = \lambda e. \text{knock}(e) \land \#e \geq 1\]
    There are at least one knock, the counting unit of which is the natural unit.
   b. \([\text{knock one knock}] = \lambda e. \text{knock}(e) \land \#e \geq 1\]
    There are at least one knock, the counting unit of which is the knock itself.

\textsuperscript{17} Such an existential interpretation may give rise to a durative reading, as in (4); see also Donazzan (2013).
Numerals are assumed to have an at least semantics, from which the exactly reading can be derived as a Gricean scalar implicature (Horn 1972; Gazdar 1979; Levinson 1983; a.o.). For instance, when yi ‘one’ is not focused, it has the at least reading ‘≥ 1’. When focused, it triggers stronger alternatives such as ‘≥ 2’ and ‘≥ 3’ and negates them, yielding the exactly reading ‘= 1’. In the case of V-NUM-CL_{evt}, as discussed in Section 4.2.2, only the ones formed with Activities I (qiao ‘knock’) can have different numerals as alternatives to derive the scalar implicature. That is, only V-NUM-CL_{evt} formed with Activities I can have the exactly reading. With Activities II (deng ‘wait’), the numeral in V-NUM-CL_{evt} is limited to the unfocused yi ‘one’ without numeral alternatives, and hence can only receive the at least reading.

(43) a. $[\text{knock one}_U F \text{xia}] = \lambda e. \text{knock}(e) \land \#e \geq 1$ Activities I  
    $[\text{knock one}_F \text{xia}] = \lambda e. \text{knock}(e) \land \#e = 1$  
    b. $[\text{wait one}_U F \text{xia}] = \lambda e. \text{wait}(e) \land \#e \geq 1$ Activities II  
    *[\text{wait one}_F \text{xia}] = \lambda e. \text{wait}(e) \land \#e = 1$

One special case of V-one$_U F$-CL_{evt} is VV. As demonstrated in Section 3.1, VV is in fact V-one$_U F$-CL_{evt} with an omitted yi ‘one’. Thereby, VV denotes an unspecified quantity of events.

(44) a. $[\text{knock } (\text{one}_U F) \text{knock}] = \lambda e. \text{knock}(e) \land \#e \geq 1$  
    b. $[\text{wait } (\text{one}_U F) \text{wait}] = \lambda e. \text{wait}(e) \land \#e \geq 1$

5. Pluractionality via competition

Based on the semantics of V-NUM-CL_{evt}, we propose the following pragmatic mechanism for deriving the pluractionality of VV formed with Activities I (Puzzle IV).

(45) Competition between VV and V-one$_F$-V  
    a. VV formed with Activities I denotes an unspecified quantity of events.  
       For example, $[\text{knock knock}] = \lambda e. \text{knock}(e) \land \#e \geq 1$  
    b. V-one$_F$-V formed with Activities I denotes exactly one event.  
       For example, $[\text{knock one}_F \text{knock}] = \lambda e. \text{knock}(e) \land \#e = 1$  
    c. With Activities I, V-one$_F$-V is a stronger alternative of VV.  
    d. Using VV implicates that V-one$_F$-V does not hold, i.e., VV denotes non-singular events.  
       For example, $[\text{knock knock}]^+ = \lambda e. \text{knock}(e) \land \#e > 1$

As mentioned in Section 3.1, V-NUM-V formed with Activities I is prevalent in late Medieval and early Modern Chinese (1200s – 1500s A.D.). For example, in (46) and (47), the numerals in V-NUM-V are focused and have the exactly reading.

(46) qu menxian-shang qiao yi$_F$ qiao, zhuo zhougongjia si yi kou.  
    go threshold-LOC knock one CL_KNOCK make Mr. Zhou’s die one CL  
    ‘If you give one knock on the threshold, one person in Mr. Zhou’s family will die.’  
    Q: qiao liang? qiao ne?  
    A: zhuo zhougongjia si liang kou.  
    knock two CL_KNOCK Q make Mr. Zhou’s die two CL  
    ‘How about giving two knocks?’  
    ‘Two people in Mr. Zhou’s family will die.’  
    (Taohuanv po fa jia Zhougong, Drama, 1200s A.D.)
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(47) wangming na-chu baobei lai, qiao-le san₃ qiao.
Wangming take-out precious.weapon come knock-PERF threeCLKNOCK
‘Wangming took out the precious weapon and gave it three knocks.’
(Sanbao tajian xiyang ji, Novel, 1500s A.D.)

The pragmatic competition between VV and V-oneF-V is observed in early Modern Chinese (1500s A.D.), as shown by (48) and (49). V-oneF-V in (48) has the exactly reading, as the master delivers one knock to each servant. Meanwhile, VV in (49) is pluractional, indicating Wangming’s intention to perform multiple knocks. This is evidenced by the fact that he eventually gave two or three knocks. In Mandarin, the pluractionality of VV formed with Activities I is inherited from cases like (49), although V-NUM-V diminishes and V-oneF-V disappears.

(48) que you qiao-le yi₂ qiao, qiahao shi dier-ge changban jiao-qilai.
but again knock-PERF one CLKNOCK just second-CL servant scream-up
‘But (he) again gave one knock, and the second servant just screamed.’
jizhi zai qiao-le yi₂ qiao, disan-ge changban you jiaojiang-qilai.
until again knock-PERF one CLKNOCK third-CL servant also scream-up
‘Until (he) gave another knock, the third servant also screamed.’
(Sanbao tajian xiyang ji, Novel, 1500s A.D.)

(49) ‘bumian qiao ta qiao, kan shi zenme.’ qiao-le liang san qiao.
have.to knock it CLKNOCK see is how knock-PERF two three CLKNOCK
“(Wangming thought,) ‘it is necessary to give some knocks on the door to see what is happening inside.’” Then he gave two or three knocks.’
(Sanbao tajian xiyang ji, Novel, 1500s A.D.)

In contrast, with Activities II (deng ‘wait’), VV lacks alternatives such as V-oneF-V, since the numeral inside V-NUM-V is limited to the unfocused yi ‘one’, as discussed in Section 4.2.2. Therefore, VV formed with Activities II does not enter the pragmatic competition in (45) and hence is not pluractional.

6. Motivation for cognate classifiers

We have advanced in Section 3 that the underlying structure of VV consists of a verb and its cognate verbal classifier, where the cognate classifier is base generated within the adjunct of the verb. In our analysis, the connection between the verb and the cognate classifier is not attributed to syntactic movement or copying. Instead, we propose that cognate classifiers are motivated by a semantic requirement.

Intuitively, the way of counting depends on the object being counted, which can be explicitly formulated in terms of the subset requirement in (50). For V-NUM-CLevt, the choice of verbal classifiers is determined by the verbs, that is, the denotation of the verb is required to be a subset of the denotation of the verbal classifier. In principle, there are two possibilities: (i) The denotation of the verb is a proper subset of that of the classifier, as is the case with the general classifier xia. (ii) The denotation of the verb equals to that of the classifier, as is the case with a cognate classifier.

18 Object insertion in such cases further demonstrates that the second V of VV is a verbal classifier (Fan 1964).
(50) **Subset requirement of dependency**

Let \( A \) and \( B \) be two sets. If \( A \) depends on \( B \), then \( B \subseteq A \).

In the case of V-NUM-CL\_evt, \([v] \subseteq [\text{Div}^{min/max}]\).

(i) If \([v^{min}] \subseteq [\text{Div}^{min/max}]\), then \(\text{Div}^{min/max}\) is realised as the general classifier \(\text{xia}\).

(ii) If \([v^{min}] = [\text{Div}^{min/max}]\), then \(\text{Div}^{min/max}\) is realised as a cognate classifier.

Overall, given the subset requirement, there are two strategies for specifying the counting unit: a general classifier representing the union set of all objects that can be counted, or a cognate classifier that is identical to the object being counted. This provides the semantic motivation for the existence of cognate classifiers in Mandarin.

The subset requirement is supported by the selectional restriction of classifiers. The general classifier \(\text{xia}\) is compatible with various verbs, as shown by (51a). By contrast, a cognate classifier, due to the absence of subset relations among different verbal roots, is only compatible with the verb that shares the same lexical form, as shown by (51b).

(51) a. \{\text{da} / \text{qiao}\} yi \text{xia}  
  hit \ knocks one \text{CL\_evt}  
  ‘to give a hit’ / ‘to give a knock’

b. \{\text{da} / *\text{qiao}\} yi \text{da}  
  hit \ knocks one \text{CL\_HIT}  
  ‘to give a hit’ / Int.: ‘to give a knock’

Note that cases like (52) are ungrammatical in Mandarin, despite certain entailment relations between verbs and classifiers.\(^{19}\) This suggests a distinction between the entailment relations and the subset relations defined in (50). The entailment relations between events are captured by conjunction, as originated in Davidson (1967). For instance, to capture the fact that \text{qiao} ‘knock’ entails \text{dong} ‘act’, we can analyse a knocking event as a modified acting event, as (53) illustrates. However, the subset relations pertain to event sets, and therefore are not guaranteed by the entailment relations between events. For instance, there is no subset relation between (53a) and (53b), that is, the denotation of \text{qiao} ‘knock’ is not a subset of the denotation of \text{dong} ‘act’. This explains why \text{dong} ‘act’ cannot serve as a classifier for the verb \text{qiao} ‘knock’.

(52) a. *\text{qiao} yi \text{dong}  
  knock one \text{CL\_ACT}  
  Int.: ‘to give a knock’

b. *da yi \text{dong}  
  hit one \text{CL\_ACT}  
  Int.: ‘to give a hit’

(53) a. \[\sqrt{\text{qiao}}\] = \{e_{\text{knock1}}, e_{\text{knock2}}, e_{\text{knock1} \oplus e_{\text{knock2}}}, \ldots\}  
  = \{(e_{\text{act}} \land e_{w/\text{hand}})_1, (e_{\text{act}} \land e_{w/\text{hand}})_2, (e_{\text{act}} \land e_{w/\text{hand}})_1 \oplus (e_{\text{act}} \land e_{w/\text{hand}})_2, \ldots\}

b. \[\sqrt{\text{dong}}\] = \{e_{\text{act1}}, e_{\text{act2}}, e_{\text{act1}} \oplus e_{\text{act2}}, \ldots\}

The subset requirement in (50) sheds light on nominal classifiers as well. Archaic Chinese features cognate classifiers that share the same lexical form as the noun, as in (54), whilst Old Chinese makes use of general classifiers that are compatible with various nouns, like \text{tou} in (55). These two strategies can also be viewed as motivated by the subset requirement.

(54) fu \text{niu} san bai wu shi wu \text{niu, yang} nian ba \text{yang}  
  capture ox three hundred five ten five \text{CL\_OX} sheep twenty eight \text{CL\_SHEEP}  
  ‘(The king) captured three hundred and fifty-five oxen and twenty eight sheep.’

(Bronze inscriptions on Xiao Yu Ding, 900s B.C.)

\(^{19}\) Thanks to a reviewer for bringing this to our attention.
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(55) huo **nu** ma yang shi wan yu tou.

 obtain ox horse sheep ten ten.thousand more CL

‘(The army) obtained over a hundred thousand oxen, horses, and sheep.’

(*Qian han ji, 100s A.D.*)

7. Conclusion

In this paper, we demonstrate that VV is an instantiation of V-(NUM)-CL_{evt}, and analyse NUM-CL_{evt} in V-NUM-CL_{evt} as an adjunct and an intersective modifier. Our syntax and semantics successfully resolve the four puzzles about VV introduced in Section 1.

For **Puzzle I**, VV allows for the insertion of numerals and aspectual markers, as it is V-CL_{evt} rather than verbal reduplication. For **Puzzle II**, given the cumulativity presupposition, only activity roots can form verbal classifiers and subsequently constitute VV. As for **Puzzle III** and **IV**, the observed pluractionality of VV is a result of its competition with V-oneF-V. Activities I (qiao ‘knock’) and Activities II (deng ‘wait’) differ in stable atomicity. VV formed with Activities I denotes a set of countable events, and competes with the singular alternative V-oneF-V. In contrast, VV formed with Activities II denotes a set of uncountable events, lacking singular alternatives like V-oneF-V for competition, and therefore does not display pluractionality.

Our analysis of VV in Mandarin offers not only a pragmatic mechanism for deriving pluractionality (cf. Lasersohn 1995; Newman 2012; Henderson 2017; Mattiola 2019; Lund 2021; Pasquereau 2021; a.o.), but also a semantic motivation for cognate classifiers in general. Yet, additional syntactic evidence is needed to argue that cognate classifiers are base generated. We leave this issue for further research.

References


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