Event counting and discontinuity of the experiential perfect[1]

Yiyang GUO — *University of Cambridge*

Abstract. This paper investigates counting in the domain of events under the Mandarin experiential perfect marker *-guo*, with particular attention to the contrast between the two counting expressions, ⌜NUM *xia*⌝ and ⌜NUM *ci*⌝, for different levels of counting. The central question is why only certain activity verbs are compatible with ⌜NUM *xia*⌝ under *-guo*, and more generally, what constrains the availability of event counting in *guo*-marked sentences. I propose that the contrast in acceptability among different activity verbs can be attributed to the presence or absence of determinate endpoints in the relevant events. The discontinuity effect of *-guo* discussed in the literature can be derived through a presupposition requiring the relevant events in its input to have determinate endpoints.

Keywords: event, countability, perfect, verbal classifiers.

1. Introduction

In Mandarin Chinese, the number of times an event occurs can be conveyed through the combination of a numeral and a verbal classifier, henceforth ⌜NUM CL⌝ (Li and Thompson, 1981). In general, activity verbs are compatible with ⌜NUM CL⌝ (Huang, 1997; Zhang, 2017; Guo, 2021; Ye and Guo, 2023; a.o.). For instance, in (1a), *yi xia* 'one time' indicates that the hitting event occurred once; similarly, in (1b), *yi xia* suggests that the hair-combing event occurred once.

(1) a. wo da-le ta **yi xia**.
1SG hit-PFV 3SG one CL_v
'I hit her one time.'[2]

b. ta shu-le **yi xia** toufa.
3SG comb-PFV one CL_v hair
'She combed hair one time.'

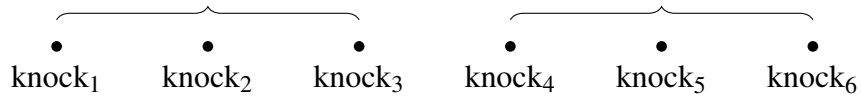
Within an event-counting expression ⌜NUM CL⌝, the numeral specifies the quantity of event occurrences, while the verbal classifier provides the counting unit and additional event-related information, including the level of counting. Observations across languages suggest that counting in the domain of events involves at least two hierarchically nested levels. These levels have been described under different terms in the literature (Andrews, 1983; Cinque, 1999; Larson, 2004; Landman, 2006; Deng, 2013; Donazzan, 2013; Bobaljik, 2017; Zhang, 2017; Ye and Guo, 2023; Guo, 2024; Wągiel, 2024; a.o.), beginning with Cusic's (1981) distinction between events and occasions. A simplified illustration of levels of counting can be given using stacked *time*-adverbials in English, as shown in (2a). Sentence (2a) exhibits two distinct levels of counting (*three times twice*). Even though (2a) gives six individual knocks in total, it is not truth-conditionally equivalent to (2b). (2a) is true in a scenario where three consecutive knocks occur twice, as sketched by (3a), but false in a scenario in which there is only a single set of

[1] I sincerely thank Rajesh Bhatt, Theresa Biberauer, Kai von Fintel, Manfred Krifka, Mingming Liu, Ian Roberts, and Shumian Ye for their insightful suggestions and stimulating discussions. I am also grateful to the reviewers of SuB 30, as well as the audience at SuB 30 and MIT Ling-Lunch, for their comments and questions. Any errors are my own.

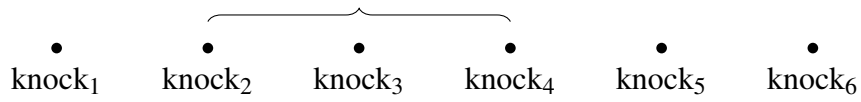
[2] The affix *-le* that follows the verb, also known in the literature as 'the verbal *-le*', is generally treated as a perfective morpheme. For simplicity, I follow Smith (1991), Lin (2005) among others and provide English translations of sentences marked by the perfective *-le* in the past tense.

three consecutive knocks alongside other individual knocks, as in (3b). By contrast, (2b) is true in both scenarios.

(2) a. John knocked on the door **three times twice**.
b. John knocked on the door **six times**.

(3) a. 

(2a) ✓ (2b) ✓

b. 

(2a) × (2b) ✓

These different levels of counting can also be realised through verbal classifiers in Mandarin Chinese (Deng, 2013; Donazzan, 2013; Zhang, 2017; Ye and Guo, 2023; Guo, 2024; Wągiel, 2024; a.o.). Among the vast collection of verbal classifiers, *xia* is used for counting at the lower level, hence glossed 'CL_{vl}', whereas *ci* is used for counting at the higher level, glossed 'CL_{vh}'. For example, to express medical dosage instructions such as 'three sprays per application, twice (in a day)', *xia* is used to count the number of individual sprays, while *ci* is used to count the number of daily applications. Here, *xia* and *ci* occupy distinct, non-exchangeable positions, as shown in (4). For now, I refer to these two levels of counting as lower-level and higher-level counting respectively; the precise targets of *xia* and *ci* will be detailed in Section 3.

(4) a. wo meitian dei pen liang **ci** yao, mei **ci** pen san **xia**.
1SG every.day need spray two CL_{vh} medicine each CL_{vh} spray three CL_{vl}
'Every day I must spray the medicine two times, each time delivering three sprays.'
b.* wo meitian dei pen liang **xia** yao, mei **xia** pen san **ci**.
1SG every.day need spray two CL_{vl} medicine each CL_{vl} spray three CL_{vh}
Int.: 'Every day I must spray the medicine two times, each time delivering three sprays.'

Against this background, the interaction between event counting and aspect reveals an unexpected restriction. First, not all activity verbs can take event counting expressions under the experiential perfect aspect marked by *-guo*, as shown by (5), even though the activity verb itself is compatible with *-guo*, as in (6). The contrast between (5a) and (5b) seems to point to a further subcategorisation of activity verbs, which leads to a question: what distinguishes the two subclasses of activity verbs so that they behave differently in co-occurrence with ⌜NUM *xia*⌝ under *-guo*? (**Puzzle I**)

(5) a. wo da-**guo** ta **yi** **xia**.
1SG hit-EXP 3SG one CL_{vl}
'I have hit him one time$_{(low)}$.'[3]

b.* wo deng-**guo** ta **yi** **xia**.
1SG wait-EXP 3SG one CL_{vl}
Int.: 'I have waited for him one time$_{(low)}$.'

(6) a. wo da-**guo** ta.
1SG hit-EXP 3SG
'I have hit him.'

b. wo deng-**guo** ta.
1SG wait-EXP 3SG
'I have waited for him.'

Second, if *xia*, the verbal classifier for lower-level counting, is replaced by *ci*, the verbal classifier for higher-level counting, all activity verbs can take ⌜NUM *ci*⌝ under *-guo*, including the

[3] To highlight different levels of counting in translation, where applicable, I use *time*-adverbials to translate higher-level counting (e.g. *two times*), and the combination of a numeral and a cognate object of the verb for lower-level counting (e.g., *three sprays*); see (4). Here, with verbs like *da* 'hit' and *deng* 'wait', cognate object constructions sound unnatural; I use subscripts *low* and *high* instead to mark counting at different levels explicitly in translation.

ones that do not work with ⌜NUM *xia*⌝, as illustrated by (7). Comparing the acceptability of (7b) with the unacceptability of (5b) leads to the second question: under what conditions does the experiential perfect *-guo* allow event counting? (**Puzzle II**)

(7) a. wo da-**guo** ta **yi** **ci**.
1SG hit-EXP 3SG one CL_{vh}
'I have hit him one time$_{(high)}$.'

b. wo deng-**guo** ta **yi** **ci**.
1SG wait-EXP 3SG one CL_{vh}
'I have waited for him one time$_{(high)}$.'

To account for the distribution of activity verbs and ⌜NUM CL⌝ under the experiential *-guo*, I propose a tripartite analysis. First, activity verbs can be subcategorised into Act_i (*da* 'hit') and Act_{ii} (*deng* 'wait'), depending on whether the events they denote are inherently discrete in the sense of having a **determinate endpoint** – in other words, whether they consist of stable atoms (cf. Chierchia, 2010). Second, what has been observed as the discontinuity effect of *-guo* is derived through a presupposition on temporal-structural properties of events: *-guo* presupposes that the events in its input have a unique maximal temporal gap that immediately succeeds the runtime of the relevant event, ends before any later relevant event, and contains no such event. ⌜V_{Act_i} NUM *xia*⌝ satisfies this presupposition, as Act_i events have a determinate endpoint. In contrast, ⌜$V_{Act_{ii}}$ NUM *xia*⌝ fails to meet this presupposition, as Act_{ii} events lack a determinate endpoint (**Puzzle I**). Third, placing the last occurrence of the Act_{ii} events inside a group of events provides a determinate endpoint independent of the event, which guarantees the existence of a gap and meets the presupposition of *-guo*. This explains the well-formedness of ⌜$V_{Act_{ii}}$ NUM *ci*⌝ under *-guo* (**Puzzle II**).

2. Activities and lower-level event counting

2.1. Availability of lower-level event counting under *-guo*

In Mandarin Chinese, *-guo* has generally been characterised as an experiential perfect marker (Li and Thompson, 1981; Smith, 1991; Klein et al., 2000; Lin, 2005; a.o.). A co-occurrence restriction is observed between *-guo* and predicates of different situation types within Vendler's (1957) classification. To start with, states like *shi* 'be' and *zhidao* 'know' are incompatible with *-guo*, as shown by (8) and (9).

(8) a. ta shi xuesheng.
3SG be student
'She is a student.'

b.*ta shi-**guo** xuesheng.
3SG be-EXP student
Intended: 'She has been a student.'

(9) a. ta zhidao zhe ge guiding.
3SG know this CL_n rule
'She knows about this rule.'

b.*ta zhidao-**guo** zhe ge guiding.
3SG know-EXP this CL_n rule
Intended: 'She has known about this rule.'

By contrast, *-guo* occurs in sentences with achievements, accomplishments, and activities, as illustrated by (10)–(12) respectively.

(10)a. ta dao-**guo** shanding.
3SG reach-EXP mountain.top
'She has reached mountain tops.'

b. ta de-**guo** jinpai.
3SG receive-EXP gold.medal
'She has received a gold medal.'

(11)a. ta da-sui-**guo** huaping.
3SG hit-break-EXP vase
'She has broken a vase.'

b. ta jian-cheng-**guo** shuidianzhan.
3SG build-up-EXP hydropower.station
'She has built a hydropower station.'

(12)a. ta da-**guo** wo.
3SG hit-EXP 1SG
'She has hit me.'

b. ta shu-**guo** toufa.
3SG comb-EXP hair
'She has combed hair.'

Among the verbs compatible with *-guo*, only activity verbs can co-occur with lower-level counting expressions such as *yi xia* 'one time$_{(low)}$'.[4] They may appear in imperatives without an overt aspectual marker, as in (13)–(14), and in non-stative sentences with a perfective *-le*, as illustrated by (15)–(16).

(13)a. ni da wo **yi** **xia**.
2SG hit 1SG one CL$_{vl}$
'You hit me one time$_{(low)}$.'

b. ni shu **yi** **xia** toufa.
2SG comb one CL$_{vl}$ hair
'You comb hair one time$_{(low)}$.'

(14)a. ni deng wo **yi** **xia**.
2SG wait 1SG one CL$_{vl}$
'You wait for me one time$_{(low)}$.'

b. ni cha **yi** **xia** dizhi.
2SG check one CL$_{vl}$ address
'You check the address one time$_{(low)}$.'

(15)a. ta da-le wo **yi** **xia**.
3SG hit-PFV 1SG one CL$_{vl}$
'She hit me one time$_{(low)}$.'

b. ta shu-le **yi** **xia** toufa.
3SG comb-PFV one CL$_{vl}$ hair
'She combed hair one time$_{(low)}$.'

(16)a. ta deng-le wo **yi** **xia**.
3SG wait-PFV 1SG one CL$_{vl}$
'She waited for me one time$_{(low)}$.'

b. ta cha-le **yi** **xia** dizhi.
3SG check-PFV one CL$_{vl}$ address
'She checked the address one time$_{(low)}$.'

Although activity verbs generally pattern alike in allowing *yi xia* 'one time$_{(low)}$' in imperatives and under the perfective *-le*, they do not behave uniformly under *-guo*. Some of the activity verbs modified by *yi xia* 'one time$_{(low)}$' are compatible with *-guo*, as shown in (17). Others, by contrast, cannot co-occur with *yi xia* 'one time$_{(low)}$' under *-guo*, as shown in (18).

(17)a. ta meiyou **da-guo** wo yi **xia**.
3SG not hit-EXP 1SG one CL$_{vl}$
'She has never once$_{(low)}$ hit me.'

b. ta zhi **shu-guo** yi **xia** toufa.
3SG only comb-EXP one CL$_{vl}$ hair
'She has only combed hair once$_{(low)}$.'

(18)a.*ta meiyou **deng-guo** wo yi **xia**.
3SG not wait-EXP 1SG one CL$_{vl}$
Int.: 'She has never once$_{(low)}$ waited for me.'

b.*ta zhi **cha-guo** yi **xia** dizhi.
3SG only check-EXP one CL$_{vl}$ address
Int.: 'She has only checked the address once$_{(low)}$.'

2.2. Empirical motivations for subclassifying activities

The contrast between (17) and (18) in lower-level event counting under *-guo* is not between activities and other Vendlerian classes, but internal to activities, and it calls for a finer-grained classification of activities. At first glance, this contrast appears to correlate with the distinction between activities in Vendler's (1957) four-way classification and semelfactives (Smith, 1991; Rothstein, 2004). Semelfactive verbs, such as *knock* and *cough*, denote a single occurrence of activities and are thus considered instantaneous. Similar to *da* 'hit' in (17), *qiao* 'knock' and *kesou* 'cough' in Mandarin can be modified by lower-level event-counting expressions under *-guo*, as shown by (19). However, the contrast between (17) and (18) cannot be reduced to the contrast between activities and semelfactives, since activities compatible with lower-level

[4] Ye and Guo (2023) provide a detailed account of why achievements reject *xia* for lower-level counting. Briefly, *xia* imposes a cumulativity presupposition of events and requires its input to contain summable events, while achievements are not summable at the lower level of event counting.

event-counting ⌜NUM *xia*⌝ under *-guo* are not unequivocally punctual. Alongside the examples in (17), there are a number of activity verbs that are clearly non-punctual or can be interpreted non-punctually, but nevertheless remain compatible with *yi xia* 'one time$_{(low)}$' under *-guo*. Verbs of this kind include *yongbao* 'hug', *run* 'wet', *dong* 'move', *zou* 'punch', *za* 'smash', *yao* 'shake', *tui* 'push', *la* 'pull', *ca* 'wipe', *rou* 'rub', *mo* 'touch', *ning* 'screw', *ji* 'squeeze', *an* 'press', and so on; see (20).

(19)a. ta meiyou **qiao-guo** yi **xia** men.
3SG not knock-EXP one CL$_{vl}$ door
'She has not given one knock on the door.'

b. ta zhi **kesou-guo** yi **xia**.
3SG only cough-EXP one CL$_{vl}$
'She has only given one cough.'

(20)a. wo gen ta **yongbao-guo** yi **xia**.
1SG and 3SG hug-EXP one CL$_{vl}$
'I have given him a hug.'

b. ta zhi **run-guo** yi **xia** zuichun.
3SG only wet-EXP one CL$_{vl}$ lip
'She has only wetted lips one time$_{(low)}$.'

The distinction between the two subclasses of activities, Activity I and Activity II (labelled Act$_i$ and Act$_{ii}$ for convenience), is also reflected in two further observations. First, Act$_i$ and Act$_{ii}$ differ in whether all numerals are equally acceptable with the verbal classifier *xia* for lower-level counting. Act$_i$ can take any numeral that provides a precise counting result. For example, the result of counting the occurrence of hitting events can be precise – *yi* 'one' and *san* 'three' are both acceptable in (21). However, with Act$_{ii}$ such as *deng* 'wait', only *yi* 'one' is allowed, which yields a vague counting result that merely indicates the existence of the event, as shown by (22).

(21)a. ta **da**-le wo **yi** xia.
3SG hit-PFV 1SG one CL$_{vl}$
'She hit me one time$_{(low)}$.'

b. ta **da**-le wo **san** xia.
3SG hit-PFV 1SG three CL$_{vl}$
'She hit me three times$_{(low)}$.'

(22)a. ta **deng**-le wo **yi** xia.
3SG wait-PFV 1SG one CL$_{vl}$
'She waited for me one time$_{(low)}$.'

b.*ta **deng**-le wo **san** xia.
3SG wait-PFV 1SG three CL$_{vl}$
Int.: 'She waited for me three times$_{(low)}$.'

Second, Activity I and Activity II are not alike in their tolerance for temporal gaps. An Act$_i$ event does not permit interruptions in any context. For instance, if a hitting event is interrupted by a brief pause, such as going to the bathroom, the hitting must be construed as two distinct events, as shown in (23a). By contrast, an Act$_{ii}$ event can accommodate interruption. If someone who is waiting for their friend briefly pauses to take a bathroom break and then resumes waiting, what happens may still be construed as a single waiting event rather than two distinct waiting events, as illustrated in (23b).

(23)a. wo da-le ta yi xia, qu cesuo hou you da-le ta yi xia.
1SG hit-PFV 3SG one CL$_{vl}$ go toilet after again hit-PFV 3SG one CL$_{vl}$
'I hit her one time$_{(low)}$. After taking a bathroom break, I hit her one more time$_{(low)}$.'
→ Two hitting events

b. wo deng-le ta yi xia, qu cesuo hou you deng-le ta yi xia.
1SG wait-PFV 3SG one CL$_{vl}$ go toilet after again wait-PFV 3SG one CL$_{vl}$
'I waited for her one time$_{(low)}$. After taking a bathroom break, I waited for her one more time$_{(low)}$.'
→ One waiting event

2.3. Subclassifying activities via determinate endpoints

The two diagnostics just discussed, namely the availability of precise counting and tolerance for temporal interruptions, point towards a single underlying property of events: whether events exhibit stable atomicity (Ye and Guo, 2023), as illustrated in (24). This is a property developed by extending Chierchia's (2010) notion of stable atomicity from the domain of individuals to the domain of events. Briefly, activities like hitting (Act_i) are stably atomic: an atomic hitting event stays atomic across all possible contexts. By contrast, there are also activities like waiting (Act_{ii}), for which a minimal waiting event may be identified across time as part of a larger waiting event.

(24) **Stable atomicity of events (Ye and Guo, 2023)**
$\text{SAT}(P)(e) \stackrel{\text{def}}{=} \exists e'[e' \sqsubseteq e \wedge P(e') \wedge \forall c[\neg\exists e'' \text{ in } c[e'' \sqsubset e']]]$

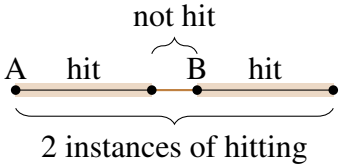
Building on the earlier notion of stable atomicity in the domain of events, I further propose that the crucial property underlying the contrast observed in experiential perfect *guo*-sentences is the presence or absence of a clear, **determinate endpoint**. The endpoint is the point at which a change of state occurs: prior to the endpoint, the event holds, whereas after the endpoint, no such event holds. Under this view, a determinate endpoint is a property of events that can be characterised in terms of a linear relation, namely **immediate succession** between intervals, together with a **gap**, i.e., a maximal interval that starts right after the runtime of the event, ends before the runtime of all subsequent *P*-events if there are any, and contains no runtime of the same event. For every *P*-event *e* with a determinate endpoint, there exists a maximal *P*-free interval that immediately succeeds the runtime of *e* and ends before the runtime of all later *P*-events if there are any. Under standard assumptions about linear time and temporal intervals, it follows that within a given context, the maximal immediately succeeding *P*-free interval is also unique. The determinate-endpoint property can be defined as (25), using basic notions from mereology and temporal semantics:

(25) **Determinate Endpoint (DEND)**
$\text{DEND}(P) \stackrel{\text{def}}{=} \forall e[P(e) \rightarrow \exists t[\text{GAP}(t,e) \wedge \forall t'[\text{GAP}(t',e) \rightarrow t' \sqsubseteq t]]]$
where $\text{GAP}(t,e) \stackrel{\text{def}}{=} t \triangleright \tau(e) \wedge \forall e'[P(e') \wedge \tau(e) \prec \tau(e') \rightarrow t \prec \tau(e')]$
For a given *P*-event *e*, every *P*-event is followed by a maximal interval that immediately succeeds it and ends before all later *P*-events, if any.
and $t' \triangleright t \stackrel{\text{def}}{=} t \prec t' \wedge \neg\exists t''[t'' \sqsubseteq t' \wedge t'' \sqsubseteq t] \wedge \neg\exists t'''[t \prec t''' \prec t']$
t' immediately succeeds t.
Every *P*-event *e* has a unique maximal gap immediately succeeding $\tau(e)$.

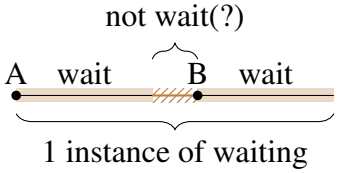
(26) presents an illustration of internal temporal structure of Activity I and Activity II events, exemplified by *da* 'hit' and *deng* 'wait', showing their difference in endpoint determinacy.

(26)

a. Act_i



b. Act_{ii}



An Act_i event, such as *da* 'hit', *shu* 'comb', *ti* 'kick', *dong* 'move', *ning* 'screw', *mo* 'touch', etc., has a determinate endpoint, and is thus inherently discrete. In (26a), between two adjacent hitting events, there is a clear temporal gap during which no hitting takes place. This gap is a maximal interval that immediately succeeds the first hitting event and ends before the second hitting event. Therefore, each hitting event remains minimal regardless of context, and there is no subevent that also qualifies as a hitting event.

By contrast, an Act_{ii} event, such as *deng* 'wait', *pei* 'accompany', *ju* 'hang out', *kao* 'test', *cha* 'check', etc., lacks a determinate endpoint, and there is no maximal *P*-free temporal interval between two adjacent *P*-events, as illustrated by *deng* 'wait' in (26b). In a given context, it may be unclear when a waiting event comes to an end by looking at the process itself. This is why two temporally adjacent instances of waiting may be cross-temporally identified as a single event (cf. Landman, 2008; Lund, 2021). Considering that a waiting event lacks an inherent determinate endpoint, if the temporal gap between them is small or not cognitively salient, the two instances of waiting may be construed as one event – the runtime of the first waiting event can be identified as part of a larger waiting event that also includes the second waiting event. It is thus unsurprising that Act_{ii} verbs such as *deng* 'wait' cannot be modified by ⌜NUM *xia*⌝ when the numeral provides a precise counting result, as shown in (22): the existence of a determinate endpoint is a prerequisite for precise counting. By recasting stable atomicity of events as the presence of a determinate endpoint in an event, which is a primitive property of events, the analysis does not have to make an ontological commitment to atoms.

2.4. Interim summary

Section 2 has established the need to distinguish two subclasses of activities. Compatibility with lower-level counting under the experiential perfect *-guo* correlates with whether an activity permits precise counting, and this pattern is also reflected in the tolerance for temporal gaps. Specifically, Activity I is compatible with lower-level counting under *-guo*. This subclass includes predicates such as *da* 'hit', *bao* 'hug', *rou* 'rub', *ca* 'wipe', *dong* 'move'. These activities permit precise lower-level counting with any numeral specifying a precise counting result, and a single instance of Act_i events does not allow temporal gaps. By contrast, Activity II is incompatible with lower-level counting under *-guo*. This subclass includes predicates such as *deng* 'wait', *cha* 'check', *ju* 'get together', *wan* 'play', *song* 'see somebody off'. These activities resist precise lower-level counting, allowing only the numeral *yi* 'one' in ⌜NUM *xia*⌝ to express a vague counting result. In addition, Activity II tolerates temporal gaps: two temporally adjacent instances of Act_{ii} events may be construed as a single event in certain contexts. The subclassification of activities can be characterised in terms of the presence or absence of a determinate endpoint: Act_i events have a determinate endpoint, whereas Act_{ii} events lack one, as summarised in Table 1.

Table 1: Subclassification of activities

Subclass	Example	V-*guo* NUM CL_{vl}	V three CL_{vl}	Temporal gaps	Determinate endpoint
Activity I	*da* 'hit'	+	+	−	+
Activity II	*deng* 'wait'	−	−	+	−

Once the contrast between Activity I and Activity II has been characterised in terms of determinate endpoints, the next section will discuss how this property affects the acceptability of event counting under *-guo*.

3. Analysis

3.1. Discontinuity effect via determinate endpoint

I have demonstrated that endpoint determinacy of events underlies the non-uniform behaviour of activity verbs with respect to precise lower-level counting and tolerance of temporal gaps. However, it remains to be explained why the pattern correlates with the acceptability pattern of lower-level event counting in experiential perfect sentences marked by *-guo*. I suggest that the answer lies in a requirement that *-guo* imposes on its input, which has been widely discussed in the literature as the **discontinuity effect** of *guo*-sentences (Chao, 1968; Iljic, 1990; Smith, 1991; Lin, 2005, 2006; a.o.). Intuitively, *-guo* marks an experience that occurs prior to a reference time but no longer holds at the point of reference. In (27a), the *guo*-sentence is incompatible with a subsequent clause that denotes a continuation of the crying event, which shows that the event in a *guo*-sentence cannot be construed as continuing up to or beyond the reference time. In this regard, *-guo* is quite different from *-le*: in the corresponding *le*-marked sentence in (27b), *-le* does not resist a continuation of the crying event.

(27) a. zuotian ta ku-guo, (#houlai ta yizhi ku).
yesterday 3SG cry-EXP afterwards 3SG all.along cry
'Yesterday, she had cried. (#Afterwards, she kept crying.)'
b. zuotian ta ku-le, (houlai ta yizhi ku).
yesterday 3SG cry-PFV afterwards 3SG all.along cry
'Yesterday, she cried. (Afterwards, she kept crying.)'

We can see that *-guo* requires a discontinuity between the endpoint of the runtime of the event and the point of reference. Since the point of reference is generally set independently of the event, the existence of such a discontinuity depends on the temporal structure of the event itself. Building on a fairly standard view of the asserted meaning of *-guo* (Lin, 2005, 2006; a.o.), I propose that the discontinuity effect associated with *-guo* can be derived from a requirement on endpoint determinacy of the event denoted by its input, namely ⌜V NUM CL⌝. This requirement is encoded as a presupposition of *-guo*. Before developing the proposal in detail, let us first consider the asserted meaning of *-guo*.

On the basis of Lin's (2005) account, I argue that the temporal meaning of *-guo* can be captured in terms of the relation among three elements: Event Time, Topic Time, and Reference Time, as illustrated by (28). Topic Time, based on Klein's (1994) notion, is the time for which a sentence is asserted to be true, while Reference Time is the time of utterance. Essentially, *-guo* asserts that Event Time is located within Topic Time and that Topic Time precedes Reference Time, thereby yielding the general past interpretation of *guo*-sentences. Under this characterisation, the temporal meaning of *-guo* relates a prior event to Reference Time, which is compatible with the anteriority theory of the perfect (Klein, 1994).

(28) **Asserted meaning of *-guo***

$[\![guo]\!] = \lambda P.\lambda t_{top}.\lambda t_{ref}.\exists e[P(e) \wedge \tau(e) \sqsubseteq t_{top} \wedge t_{top} \prec t_{ref}]$
(cf. Lin, 2005)

The asserted meaning of *-guo* is supported by evidence that is independent of event-counting expressions. In (29a), Event Time is the time when the paper-publishing event takes place, Topic Time is expressed by *qunian zhe ge shihou* 'this time last year', and Reference Time is by default the moment of speaking. Here, Event Time falls within the boundaries of Topic Time in both (29a) and (29b), but the acceptability of *-guo* depends on the temporal relation between Topic Time and Reference Time: *-guo* is only acceptable when Topic Time precedes Reference Time, as in (29a).

(29)a. qunian zhe ge shihou, ta jiu yijing fabiao-guo lunwen le.
last.year this CL time 3SG then already publish-EXP paper SFP
'By this time last year, she had already published a paper.'
b.*mingnian zhe ge shihou, ta jiu yijing fabiao-guo lunwen le.
next.year this CL time 3SG then already publish-EXP paper SFP
Int.: 'By this time next year, she will already have published a paper.'

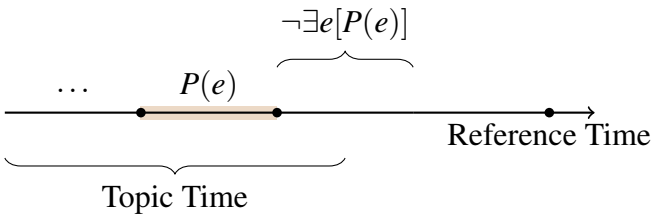
With the asserted meaning in place, I now turn to the other crucial component of the semantics of *-guo*: the determinate-endpoint presupposition. I propose that *-guo* presupposes the existence of a determinate endpoint for the relevant event in its input, and the full lexical entry of *-guo* is given in (30). The requirement of endpoint determinacy can be formalised as the DEND operator, as defined in (25) in Section 2.3.

(30) **Semantics of *-guo***
$[\![guo]\!] = \lambda P.\lambda t_{top}.\lambda t_{ref} : \mathbf{DEND(P)}.\exists e[P(e) \wedge \tau(e) \sqsubseteq t_{top} \wedge t_{top} \prec t_{ref}]$
(cf. Lin, 2005)

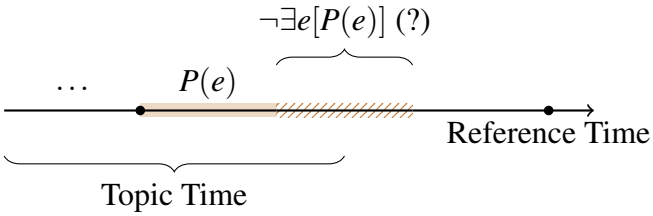
Essentially, *-guo* presupposes that for every *P*-event, there exists a gap *t*, namely the maximal temporal interval that immediately succeeds the runtime of that event, ends before all later *P*-events if there are any, and contains no *P*-event. Since the presence of a determinate endpoint is required for each and every *P*-event denoted by ⌜V NUM CL⌝, which is the input of *-guo*, it follows that the last relevant *P*-event before Reference Time must have a maximal immediately succeeding *P*-free interval, thereby deriving the discontinuity effect. The discontinuity effect can be understood as a clear change of state after the last *P*-event before Reference Time. Therefore, our characterisation of the semantics of *-guo* is also compatible with Pan and Lee's (2004) representation of the 'change-out-of-state' property of *-guo* that requires a termination of the previous state.

Let us now consider how events denoted by different activity verbs interact with *-guo* when they are being counted. (31) provides an interval-based temporal representation of *guo*-sentences where a verb *P* is modified by a lower-level event-counting ⌜NUM *xia*⌝. Within a given context, there are a number of *P*-events whose runtimes are located within Topic Time, and all relevant *P*-events are assumed to be homogeneous with respect to endpoint determinacy: if one *P*-event has a determinate endpoint, then all *P*-events of the same type do. A determinate endpoint can be viewed as a point of change from a *P*-interval to a *P*-free interval. There are two possible scenarios regarding endpoint determinacy of the relevant *P*-events, illustrated by (31a) and (31b) respectively:

(31) a.



b.



As shown in Section 2, events denoted by verbs of Activity I such as *da* 'hit', *shu* 'comb', *ti* 'kick', *mo* 'touch', and *rou* 'rub' have determinate endpoints. Therefore, the last occurrence in a sequence of Act_i events also has a determinate endpoint. This guarantees the existence of an immediately succeeding maximal gap during which the event does not hold, which appears as a discontinuity between the last occurrence of Act_i events and Reference Time, as illustrated in (31a). In this case, the presupposition of *-guo* is satisfied, and $\ulcorner \text{V}_{Act_i}$*-guo* NUM *xia*$\urcorner$ is acceptable.

By contrast, events denoted by verbs of Activity II such as *deng* 'wait', *pei* 'accompany', *ju* 'hang out together', *cha* 'check', *chang* 'taste', etc., lack determinate endpoints, which means that the last occurrence in a sequence of Act_{ii} events also lacks a determinate endpoint, as demonstrated in (31b). Since there is no maximal *P*-free interval that immediately succeeds the runtime of any relevant Act_{ii} event, there is no clear change of state after the last Act_{ii} event. As such, it is impossible to identify the point at which the transition to a *P*-free interval occurs by looking at the event itself. For Act_{ii} events such as *deng* 'wait', not every relevant event can have a maximal gap, since two temporally adjacent instances of waiting can be cross-temporally identified as a single event, as shown by their tolerance for interruptions in (23b). For Act_{ii} events like *chang* 'taste', none of the relevant events has an identifiable maximal gap, since the endpoint is not explicit by looking at the process of tasting alone. In other words, what counts as completing the wine-tasting is not event-internally determined: the endpoint could be identified when the wine is swallowed, after a sip, after the lingering flavour fades, or at any other contextually relevant time point. In this case, the presupposition of *-guo* is not satisfied, and $\ulcorner \text{V}_{Act_{ii}}$*-guo* NUM *xia*$\urcorner$ is unacceptable.

The analysis developed so far explains why activity verbs pattern non-uniformly with lower-level event-counting $\ulcorner$NUM *xia*$\urcorner$ under *-guo* (**Puzzle I**). In contrast to verbs of Activity I (e.g., *da* 'hit'), verbs of Activity II (e.g., *deng* 'wait') cannot be modified by $\ulcorner$NUM *xia*$\urcorner$ in a *guo*-sentence ($^*\text{V}_{Act_{ii}}$*-guo* NUM *xia*), and they are incompatible with precise counting at the lower level ($^*\text{V}_{Act_{ii}}$ three *xia*). However, once the verbal classifier *xia* is replaced by *ci*, the contrast between the two subclasses disappears: verbs of Activity II are compatible with $\ulcorner$NUM *ci*$\urcorner$ under *-guo*, just like verbs of Activity I (**Puzzle II**), as shown earlier in (7). Why does a change in the level of counting affect the compatibility of Activity II verbs with event counting in -

guo sentences? In the next subsection, I argue that higher-level counting introduces a clear boundary external to the relevant event and coerces a determinate endpoint that satisfies the presupposition of *-guo*.

3.2. A way to coerce an endpoint

The remaining puzzle is why the same Activity II predicates become acceptable once the level of counting shifts to the higher level, as exemplified in (32).

(32)a.*wo deng-guo ta yi **xia**.
1SG wait-EXP 3SG one CL_{vl}
Intended: 'I have waited for him one $time_{(low)}$.'
b. wo deng-guo ta yi **ci**.
1SG wait-EXP 3SG one CL_{vh}
'I have waited for him one $time_{(high)}$.'

At the same time, the restriction on numerals observed with Activity II verbs does not seem to carry over to higher-level counting. As discussed in Section 2, Activity II events (e.g., *deng* 'wait') cannot be precisely counted at the lower level: they reject most numerals that express an exact number as a counting result, except for unfocused *yi* 'one' indicating the existence of the event. However, Activity II verbs allow the higher-level counting expression ⌜NUM *ci*⌝ for any choice of numeral, as shown by (33).

(33)a. wo deng-le ta {**yi** / *__liang__ / *__san__ / *__shi__} **xia**.
1SG wait-PFV 3SG one two three ten CL_{vl}
'I waited for him {one / #two / #three / #ten} $times_{(low)}$.'
b. wo deng-le ta {**yi** / **liang** / **san** / **shi**} **ci**.
1SG wait-PFV 3SG one two three ten CL_{vh}
'I waited for him {one / two / three / ten} $times_{(high)}$.'

A comparable change in acceptability is found in *guo*-sentences as well. Unlike lower-level counting, higher-level counting with ⌜NUM *ci*⌝ is acceptable for Activity II verbs under *-guo* with any numeral, as shown in (34).

(34)a. wo deng-**guo** ta {*__yi__ / *__liang__ / *__san__ / *__shi__} **xia**.
1SG wait-EXP 3SG one two three ten CL_{vl}
'I have waited for him {#one / #two / #three / #ten} $times_{(low)}$.'
b. wo deng-**guo** ta {**yi** / **liang** / **san** / **shi**} **ci**.
1SG wait-EXP 3SG one two three ten CL_{vh}
'I have waited for him {one / two / three / ten} $times_{(high)}$.'

For a sequence of events lacking determinate endpoints, like the ones denoted by Activity II verbs such as *deng* 'wait' in (33) and (34), it is impossible to identify a unique maximal *P*-free gap that immediately succeeds the runtime of the relevant *P*-event, and the presupposition of *-guo* is not satisfied. However, even if the event itself lacks a determinate endpoint, such an endpoint can be coerced through higher-level counting. As introduced in Section 1, the verbal classifier *ci* provides a unit for higher-level counting in the domain of events (Deng, 2013; Donazzan, 2013; Zhang, 2017; Ye and Guo, 2023; Guo, 2024; Wągiel, 2024), which intuitively corresponds to the **occasion** level in Cusic's (1981) system. In the medicine-applying situation described by (4), repeated here as (35), the target counted by *ci* can be subdivided into the target

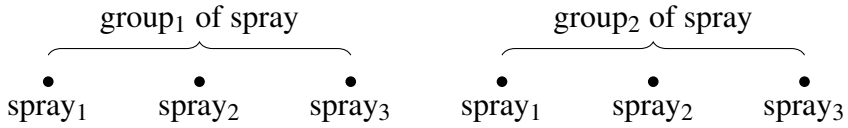
of *xia*: one daily application of medicine is composed of several individual sprays of medicine, as shown by (35a). However, the target of *xia* cannot be subdivided into the target of *ci*; see (35b).

(35)a. wo meitian dei pen liang **ci** yao, mei **ci** pen san **xia**.
1SG every.day need spray two CL_{vh} medicine each CL_{vh} spray three CL_{vl}
'Every day I must spray the medicine two times, each time delivering three sprays.'

b.*wo meitian dei pen liang **xia** yao, mei **xia** pen san **ci**.
1SG every.day need spray two CL_{vl} medicine each CL_{vl} spray three CL_{vh}
Int.: 'Every day I must spray the medicine two times, each time delivering three sprays.'

On the basis of this relation, I adopt the notion of **group** (Link, 1984; Landman, 1989a, b) and analyse the target of *ci* as **groups of events**, while the target of *xia* is **events**. That is to say, the sentence in (35a) describes two groups of medicine-spraying events, each group consisting of three medicine-spraying events, as illustrated by (36).

(36)



Following general assumptions in Neo-Davidsonian event semantics, the denotations of *pen san xia* 'spray three CL_{vl}' and *pen liang ci* 'spray two CL_{vh}' in (35a) can be represented as (37), where the group-forming operator $\uparrow$ (Link, 1984; Landman, 1989a, b) is used to characterise groups of events.

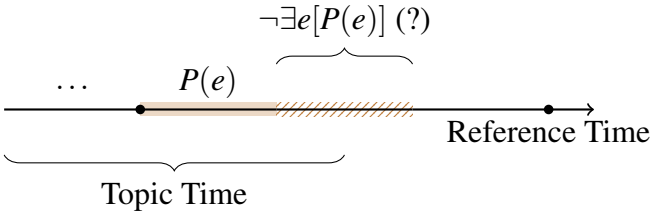
(37)a. $[\![\text{spray three } xia]\!] = \{e_{spray1} \oplus e_{spray2} \oplus e_{spray3}, \ldots\}$
b. $[\![\text{spray two } ci]\!] = \{\uparrow (e_{spray1} \oplus e_{spray2} \oplus e_{spray3}) \oplus \uparrow (e_{spray1} \oplus e_{spray2} \oplus e_{spray3}), \ldots\}$

Turning to verbs of Activity II with higher-level counting $\ulcorner\text{NUM } ci\urcorner$, the target of $\ulcorner\text{NUM } ci\urcorner$, i.e., occasions, can be analysed as groups of events. In the case of *deng* 'wait', one or several temporally adjacent waiting events can form a waiting occasion, and the runtime of a waiting event is a subset of the runtime of the waiting occasion that contains it. Unlike a single waiting event, the moments at which a waiting occasion starts and ends can be identified with the help of event-external information. For instance, the endpoint of a waiting occasion can be identified as the point when the person being waited for arrives, or when the person who has been waiting gives up and leaves. Since the relevant waiting event can extend to the endpoint of the waiting occasion, the occasion provides a clear external boundary for the waiting event that it contains, and thus a determinate endpoint can be identified by looking at the waiting occasion. This analysis is also in line with the general assumption that groups are atomic (Link, 1984; Landman, 1989a, 2000, 2006; Snyder and Shapiro, 2022). Since an occasion, i.e., a group of events, supplies an external determinate endpoint for the events it contains, groups of Act_{ii} events are compatible with precise counting, as demonstrated in (33b) and (34b).

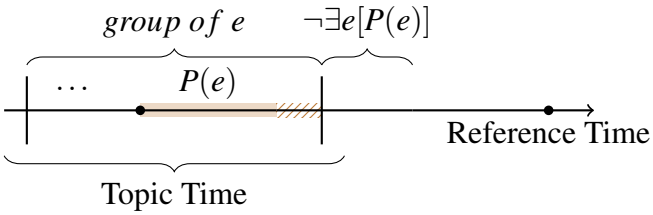
In the same vein, we can see why Activity II verbs become acceptable once counting shifts to the higher level. The temporal structure of groups of events, as well as their relation to Topic Time and Reference Time, is presented in (38). Although Act_{ii} events lack an inherent determinate endpoint, as illustrated in (38a), a determinate endpoint can be coerced by placing the last occurrence of such *P*-events within a group of *P*-events while ensuring that Reference

Time remains outside this group of *P*-events. Since a group of *P*-events can also be understood intuitively as a *P*-occasion, the clear boundary of that *P*-occasion, which is external to the relevant *P*-event, ensures the existence of a maximal *P*-free interval before Reference Time, as illustrated in (38b). Through the determinate endpoint supplied by this event-external boundary, the presupposition of *-guo* is satisfied, and Activity II verbs modified by ⌜NUM *ci*⌝ are acceptable under *-guo*.

(38) a.



b.



In addition, the acceptability of bare Activity II verbs under *-guo*, as shown in (39), can also be attributed to the fact that the presupposition of *-guo* can be satisfied not only by an inherent determinate endpoint but also by a coerced, external one. A bare ⌜V-*guo*⌝ sentence can by default be interpreted at the occasion level, where external components may supply the relevant endpoint. That is to say, ⌜V-*guo*⌝ can be construed as ⌜V-*guo yi ci*⌝ where the unfocused *yi* 'one' indicates the existence of the occasion. In the case of *deng* 'wait' in (39a), the endpoint of waiting can be identified by the arrival of the person being waited for, or by the agent's intention to give up and leave. For *ju* 'hang out together' in (39b), the endpoint can be identified by the overall spatial location of the participants or by the arrival or departure of some salient participants. With a coerced determinate endpoint, there must be a maximal *P*-free gap that immediately succeeds the runtime of the relevant occasion, which satisfies the presupposition of *-guo*.

(39)a. wo deng-**guo** ta.
1SG wait-EXP 3SG
'I have waited for him.'

b. women ju-**guo**.
1SG hang.out.together-EXP
'We have hung out together.'

3.3. Prediction

On this analysis, the discontinuity effect of the Mandarin experiential perfect *-guo* follows from a presupposition that requires the existence of a determinate endpoint for its input. This requirement applies whether the input consists of events, as with lower-level counting, or groups of events, as with higher-level counting. In lower-level (event-level) counting under *-guo*, this requirement gives rise to a contrast in acceptability between verbs of Activity I and Activity II.

The perfective marker *-le*, on the other hand, does not impose such a requirement on its input. With all other components being the same and no further specification, the *guo*-sentence in (40a) entails that the leg has recovered from the breaking event by Reference Time, while the corresponding *le*-sentence in (40b) allows an interpretation where the leg might still be broken at Reference Time.

(40)a. ta de tui shuai-duan-**guo**.
3SG MOD leg fall-break-EXP
'His leg had been broken.' → no longer broken

b. ta de tui shuai-duan-**le**.
3SG MOD leg fall-break-PFV
'His leg was broken.' → still broken

Given the difference between *-guo* and *-le*, this analysis correctly predicts that the acceptability contrast between verbs of Activity I (e.g., *da* 'hit') and Activity II (e.g., *deng* 'wait') with event-level counting under *-guo* is not observed in sentences marked by *-le*: both subclasses of activity verbs are compatible with *yi xia* 'one time$_{low}$' under *-le*, as shown in (41).

(41)a. wo da-le ta yi xia.
1SG hit-PFV 3SG one CL$_{vl}$
'I hit him one time$_{(low)}$.'

b. wo deng-le ta yi xia.
1SG wait-PFV 3SG one CL$_{vl}$
'I waited for him one time$_{(low)}$.'

4. Conclusion

This work examines the compatibility of activity verbs and two types of event-counting expressions (⌜NUM *xia*⌝ and ⌜NUM *ci*⌝) under the experiential perfect marker *-guo* in Mandarin Chinese. It addresses two puzzles: first, why activity verbs differ in their compatibility with ⌜NUM *xia*⌝ under *-guo* (**Puzzle I**); and second, under what conditions event counting is available under *-guo* (**Puzzle II**).

The preceding sections derive both puzzles from an interaction between the level of counting and the determinate-endpoint presupposition of *-guo*. First, activity verbs can be divided into two subclasses, Activity I (e.g., *da* 'hit') and Activity II (e.g., *deng* 'wait'), depending on whether the events they denote have a determinate endpoint.

Second, the discontinuity effect of the experiential perfect marker *-guo* can be derived from its presupposition that there must be a determinate endpoint for its input. More specifically, in addition to asserting that Event Time is located within Topic Time, and that Topic Time precedes Reference Time, *-guo* presupposes the existence of a maximal interval that immediately succeeds the runtime of that event, ends before all later relevant events if there are any, and contains no such event. Events of Activity I, such as *da* 'hit', have determinate endpoints and therefore can guarantee the existence of such an interval, which satisfies the presupposition of *-guo*. As a result, ⌜V$_{Act_i}$*-guo* NUM *xia*⌝ is acceptable. By contrast, events of Activity II, such as *deng* 'wait', lack determinate endpoints. Consequently, not every Activity II event can be immediately succeeded by a maximal interval during which there is no such event. Therefore, at the event level, Activity II fails to meet the determinate-endpoint presupposition of *-guo*, and ⌜V$_{Act_{ii}}$*-guo* NUM *xia*⌝ is unacceptable. This resolves **Puzzle I**.

Third, at the level of groups of events, or more intuitively at the occasion level, all activity verbs can satisfy the determinate-endpoint presupposition of *-guo*. This is because an occasion has a clear boundary external to the events it contains and can thus provide a determinate endpoint, thereby meeting the presupposition of *-guo*. This resolves **Puzzle II**.

Finally, the analysis makes a further prediction. Since the Mandarin perfective marker *-le* does not exhibit a comparable discontinuity effect, the two subclasses of activities should not differ in their compatibility with *yi xia* 'one time$_{(low)}$' for counting at the event level. This prediction is indeed borne out in Mandarin.

References

Andrews, A. (1983). A note on the constituent structure of modifiers. *Linguistic Inquiry 14*(4), 695–697.

Bobaljik, J. D. (2017). Distributed Morphology. In M. Aronoff (Ed.), *Oxford Research Encyclopedia of Linguistics*.

Chao, Y. R. (1968). *A Grammar of Spoken Chinese*. Berkeley, CA: University of California Press.

Chierchia, G. (2010). Mass nouns, vagueness and semantic variation. *Synthese 174*(1), 99–149.

Cinque, G. (1999). *Adverbs and Functional Heads: A Cross-Linguistic Perspective*. New York: Oxford University Press.

Cusic, D. D. (1981). *Verbal Plurality and Aspect*. Ph. D. thesis, Stanford University.

Deng, D. (2013). *The Syntax and Semantics of Event Quantifiers in Mandarin Chinese*. Ph. D. thesis, The University of Wisconsin-Madison.

Donazzan, M. (2013). On counting and measuring events. In E. Chemla, V. Homer, and G. Winterstein (Eds.), *Proceedings of Sinn und Bedeutung 17*, pp. 219–236.

Guo, Y. (2021). Hanyu dongzuo jiliang de jufa yuyi yanjiu [The syntax and semantics of counting in the domain of events in Chinese]. Master's thesis, Peking University.

Guo, Y. (2024). Theme maximalization through modifiers: A case of Mandarin verbal classifier bian. *Proceedings of the Linguistic Society of America 9*(1), 5721–5721.

Huang, C.-T. J. (1997). On lexical structure and syntactic projection. *Chinese Languages and Linguistics* (3), 45–89.

Iljic, R. (1990). The verbal suffix -guo in Mandarin Chinese and the notion of recurrence. *Lingua 81*(4), 301–326.

Klein, W. (1994). *Time in Language*. London: Routledge.

Klein, W., P. Li, and H. Hendriks (2000). Aspect and Assertion in Mandarin Chinese. *Natural Language & Linguistic Theory 18*(4), 723–770.

Landman, F. (1989a). Groups, I. *Linguistics and Philosophy 12*(5), 559–605.

Landman, F. (1989b). Groups, II. *Linguistics and Philosophy 12*(6), 723–744.

Landman, F. (2000). *Events and Plurality*. Dordrecht: Springer Netherlands.

Landman, F. (2006). Indefinite time-phrases, in situ-scope, and dual-perspective intensionality. In S. Vogeleer and L. Tasmowski (Eds.), *Non-Definiteness and Plurality*, pp. 237–266. Amsterdam: John Benjamins Publishing Company.

Landman, F. (2008). 1066: On the differences between the tense-perspective-aspect systems of English and Dutch. In S. D. Rothstein (Ed.), *Theoretical and Crosslinguistic Approaches to the Semantics of Aspect*, Linguistik Aktuell/Linguistics Today (LA), pp. 107–166. Amsterdam: John Benjamins Publishing Company.

Larson, R. K. (2004). Sentence final adverbs and "scope". *Proceedings of NELS 34*, 23–43.

Li, C. N. and S. A. Thompson (1981). *Mandarin Chinese: A Functional Reference Grammar*. Berkeley: University of California Press.

Lin, J.-W. (2005). Time in a language without Tense: The case of Chinese. *Journal of Semantics 23*(1), 1–53.

Lin, J.-W. (2006). Predicate restriction, discontinuity property and the meaning of the perfective marker *guo* in Mandarin Chinese. *Journal of East Asian Linguistics 16*(3), 237–257.

Link, G. (1984). Hydras. On the logic of relative clause constructions with multiple heads. In F. Landman and F. Veltman (Eds.), *Proceedings of the Fourth Amsterdam Colloquium*, pp. 245–257. Foris Publications.

Lund, G. N. (2021). *Pluractionality in Progress*. Ph. D. thesis, Harvard University.

Pan, H. and P. P. L. Lee (2004). The role of pragmatics in interpreting the Chinese perfective markers -*guo* and -*le*. *Journal of Pragmatics 36*(3), 441–466.

Rothstein, S. (2004). *Structuring Events: A Study in the Semantics of Lexical Aspect* (1 ed.). Malden / Oxford / Carlton: Blackwell Publishing.

Smith, C. S. (1991). *The Parameter of Aspect*. Dordrecht: Springer Science+Business Media.

Snyder, E. and S. Shapiro (2022). Groups, sets, and paradox. *Linguistics and Philosophy 45*(6), 1277–1313.

Vendler, Z. (1957). Verbs and times. *The Philosophical Review 66*(2), 143–160.

Wągiel, M. (2024). Acts, occasions and multiplicatives: A mereotopological account. *Semantics and Linguistic Theory*, 276–297.

Ye, S. and Y. Guo (2023). Pluractionality via competition: VV in Mandarin Chinese. *Proceedings of Sinn und Bedeutung 27*, 729–747.

Zhang, N. N. (2017). The syntax of event-internal and event-external verbal classifiers. *Studia Linguistica 71*(3), 266–300.