Temporal Relations in the V_1 *zhe* V_2 Construction in Mandarin Chinese

Jiun-Shiung Wu[a], Liang-Ting Juan[b] and Jenny Yi-Chun Kuo[c]

[a]Institute of Linguistics, National Chung Cheng University

168, University Road, Minhsiung, Chiayi County, Taiwan, 621

[b,c]Department of Foreign Languages, National Chiayi University

85, Wenlong, Minhsiung, Chiayi County, Taiwan, 621

Lngwujs@ccu.edu.tw, wonder.a23aa@msa.hinet.net, jennykuo@mail.ncyu.edu.tw

Abstract

In this paper, we examine the temporal relations in the V_1 zhe V_2 construction in Mandarin Chinese. In addition to temporal overlapping as observed in the related literature on the V_1 zhe V_2 construction, we find that temporal advancement is also possible. Following the idea of Segmented Discourse Representation Theory that temporal relations are determined by rhetorical relations, we propose that V_1 is, by default, attached to V_2 by Elaboration *and* Background *because V_1 serves both as a durative background and a manner for V_2. These two rhetorical relations indicate temporal overlapping. V_1 can be attached to V_2 by* Narration *if and only if V_2 provides a final endpoint for V_1.* Narration *indicates temporal advancement. Temporal reversal is not possible because the Iconicity Principle can be interpreted as a constraint: the word order in a sentence cannot be reversal of the temporal order. We also utilize the Segmented Discourse Representation Theory to derive the temporal readings in the V_1 zhe V_2 construction.*

Keywords

V_1 *zhe* V_2, temporal relation, Mandarin Chinese

1. Introduction

Situations described by verbs (and their arguments) can be temporally ordered. Asher and Lascarides (2003) propose Segmented Discourse Representation Theory (SDRT) and argue

that temporal relations, among many other inter-sentential linguistic phenomena, are determined by rhetorical relations. Following Asher and Lascarides' (2003) idea, Wu (2003, 2007a, 2007b, 2009, 2010, and 2011) conducts a series of research on how temporal relations in Mandarin Chinese (hereafter, Chinese) are determined. Wu (2003, 2007a, 2009, and 2010) examines how aspect markers in Chinese influence temporal relations. Wu (2007b) discusses how the temporal relations among sentences or clauses without aspect markers are determined. Wu (2011) addresses how evaluative modals *jingran* and *guoran* affect temporal relations.

Wu (2003, 2007a) talks about the V_1 *zhe* V_2 construction in Chinese. He proposes that the two events described in the V_1 *zhe* V_2 construction temporally overlap with each other because temporal overlapping is the temporal relation defeasibly specified by the durative *zhe*. See the example below.

(1) Zhangsan   kuo-zhe   paochuqu

    Zhangsan   cry-Dur[1]   run.out

    'Zhangsan ran out, crying.'

(1) contains two events: a *cry* event and a *run out* event. In this example, the *cry* event and the *run out* event temporally overlap, that is, these two events occur simultaneously. However, we find examples of the V_1 *zhe* V_2 construction that do not show temporal overlapping. Examine the following examples.

(2) a. Zhangsan   che-zhe   kuzhi   rengjin   huolu

      Zhangsan   drag-Dur   dead.tree.branch throw.in   stove

      'Zhangsan dragged the dead branches and threw them into the stove.'

   b. Lisi tui-zhe   lunyi   dao zoulang   qu

      Lisi push-Dur   wheelchair to   corridor   go

      'Lisi pushed the wheel chair and went to the corridor.'

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[1] The abbreviations used in this paper include: CL for a classifier, DE for a modifier-modifiee marker, Disp for a disposal marker, Dur for the durative imperfective marker, Pfv for the perfective aspect marker, Prg for the progressive imperfective marker, Rel for a relative clause marker.

In (2), instead of temporal overlapping, the events in the V_1 *zhe* V_2 construction actually occur in the order they are described. For (2a), the *drag the dead branches* event occurs before (in the past of) the *throw the branches into the stove* event. For (2b), the *push the wheelchair* event takes place before the *go to the corridor* event.

In this paper, we discuss how many temporal relations the V_1 *zhe* V_2 construction can describe and how the temporal relations are determined. Then, we use SDRT to model the linguistic phenomena we observe.

This paper is organized as follows. Section Two is literature review, where we briefly introduce SDRT and critically review Wu (2003, 2007a), which discusses the semantics of durative *zhe* and progressive *zai* and the influence of these two imperfective markers in Chinese on temporal relations. In Section Three, we present relevant data and examine how the temporal relations in the V_1 *zhe* V_2 construction are decided. Section Four concludes this paper.

2. Literature Review

In this section, we, first, provide a brief introduction to SDRT. Then we critically review Wu (2003, 2007a), where the influence of progressive *zai* and durative *zhe* on temporal relations is discussed, and point out its disadvantage.

Asher and Lascarides (2003) adopt Mann and Thompson's (1988) idea about discourse relations and propose three points: First, the sentences in a coherent discourse are connected to each other by appropriate rhetorical relations; second, a discourse has a hierarchical, rather than linear, structure, and third, rhetorical relations determine inter-sentential phenomena, including temporal relations. The proposal is adopted in this paper, that rhetorical relations determine temporal relations, along the same lines of Asher and Lascarides (2003), and Wu (2007a, 2007b, 2009, 2010, 2011).

Wu (2003, 2007a) examine how the imperfective markers in Chinese affect temporal relations. Based on the semantics of imperfective markers, he proposes a default function and a temporal constraint as follows:

- Rule 1: The Temporal Functions of Imperfective Markers in Chinese

a. Default Function:

A sentence with an imperfective marker is connected to another sentence by *Background* unless indicated otherwise.

b. Temporal Constraint:

The narrative time of a sentence with an imperfective marker cannot be advanced unless a final endpoint is provided for the sentence.

Let's look at two examples that demonstrate how the default function and temporal constraint in Rule 1 work.

(3) a. Zhangsan   zai   youyong

     Zhangsan   Prg   swim

     'Zhangsan was swimming.'

  b. Lisi kandao le,   renbuzhu   jiao   le   ta   ji   zhao

     Lisi see   Pfv   cannot.help.but   show pfv he   several   move

     'Lisi saw him, and could not help but show him a few moves.'

(4) a. Zhangsan   dao-le   yi-bei   re   niunai

     Zhagnsan   pour-Pfv   one-CL   hot   milk

     'Zhangsan poured a glass of hot milk.'

  b. qiao-zhe   (*zai   qiao)   Xiaomei   hexiaqu

     watch-dur   (*Prg   watch)   Xiaomei   drink.down

     '(He) watched Xiaomei drink (it).'

  c. you ti   ta   long-le-long   beiwo

     then for   she   tuck-Pfv-tuck   comforter

     'Then, (he) tucked her in.'

In (3), there is no cue phrase or other information that indicates which rhetorical relation connects (3a) and (3b). Therefore, the default function of Rule 1 applies and specifies that (3a) are connected to (3b) by *Background*. *Background* indicates temporal overlapping and therefore (3a) and (3b) temporally overlap with each other.

In (4), (4b) contains the durative *zhe*. The *watch* event is presented by the durative *zhe*

and the *Xiaomei drink hot milk* event provides a final endpoint for the *watch* event. Hence, (4c) can describe the situation that takes place after the event expressed by (4b). As shown by (4b), if we replace the durative *zhe* with the progressive *zai*, then the sentence becomes ungrammatical and the whole discourse becomes infelicitous. The temporal constraint of Rule 1 is obeyed in the case of durative *zhe* and hence temporal advancement is allowed in this example.

Wu (2003) also suggests that, in the V_1 *zhe* V_2 construction, the default function of Rule 1 kicks in and specifies that V_1 serves as *Background* for V_2. This explains the temporal relation between V_1 and V_2. However, as presented in Section One, temporal overlapping is not the only possible temporal relation for the two events in the V_1 *zhe* V_2 construction. Therefore, a further examination is called for.

3. Temporal Overlapping and Temporal Advancement

In this section, we first present relevant data of temporal overlapping and temporal advancement, and provide a generalization. We argue that whether a final endpoint is available for V_1 is the key to distinguish temporal overlapping and temporal advancement. We also discuss why there is no example of temporal reversal between V_1 and V_2 in the V_1 *zhe* V_2 construction. Then, we formalize the default function and temporal constraint proposed and use SDRT to modal the linguistic phenomena observed.

3.1. Whether a Final Endpoint is Imposed

We examine data from the Sinica Corpus and from the internet. We find that the V_1 *zhe* V_2 construction demonstrates two types of temporal relations: temporal advancement and temporal overlapping. We do not find any example of temporal reversal, i.e. V_2 occurs before V_1. Let's look at the following examples.

(5) a. ta wo-zhe   maikefeng changge

　　　He   hold-Dur   microphonesing

　　　　'He sang, holding a microphone.'

　　b. ta　　bi-zhe　　yanjing　he　　　　mama　　zhu de　tang

　　　　he　　close-Dur eye　　　drink　　　mom cook Rel　soup

'He drank the soup his mom cooked, with his eyes closed.'

c. ta   ku-zhe   paochu   jiaoshi

  he   cry-Dur   run.out   classroom

'He ran out of the classroom, crying.'

(6) a. li   laoshi   kai-zhe   che dao xuexiao   shangke

  Li   teacher   drive-Dur   car to   school   teach

'Teacher Li drove to school and taught.'

b. Zhangsan   che-zhe   kuzhi   rengjin   huolu

  Zhangsan   drag-Dur   dead.tree.branch throw.in   stove

'Zhangsan dragged the dead branches and threw them into the stove.'

c. Lisi   tui-zhe   lunyi   dao zoulang   qu

  Lisi   push-Dur   wheelchair   to   corridor   go

'Lisi pushed the wheel chair and went to the corridor.'

(5) are examples of temporal overlapping. In (5a), the *hold the microphone* event and the *sing* event occur simultaneously. In (5b), the *close eyes* event and the *drink soup* event take place at the same time. In (5c), the *cry* event and the *run out of the classroom* event are realized concurrently.

On the other hand, (6) are examples of temporal advancement. In (6a), the *drive* event ends before the *teach* event occurs. In (6b), the *drag dead branches* event stops before the *throw them (the dead branches) into the stove* event takes place. In (6c), the *push the wheel chair* event is finished before the *go to the walk way* event is realized.

So, how are the two temporal relations determined? Let's look at the examples of temporal overlapping first. Li and Thompson (1981: 223) suggest that V_1 in the V_1 *zhe* V_2 construction serves a durative background. Based on Hopper's (1979) idea that an imperfective event tends to serve as a background, Wu (2003: 161-164) also proposes that V_1 in the V_1 *zhe* V_2 construction functions as a background. Although he does not discuss the V_1 *zhe* V_2 construction, Wu (2007a) suggests that a situation presented by an imperfective marker defeasibly serves as temporal background in Chinese. To put it in SDRT's terms, a sentence with an imperfective marker is defeasibly connected to another sentence by *Background*.

Although *Background* provides the correct temporal relation, it is not the only appropriate rhetorical relation to connect V_1 and V_2 in the V_1 *zhe* V_2 construction. In addition to serving as a durative background, V_1 in the V_1 *zhe* V_2 construction has another function: It also describes the manner in which V_2 is performed. For example, in (5a), *hold a microphone* is a manner how the *sing* event is performed. In (5b), *close his eyes* is the manner how the *drink soup* event is carried out. In (5c), *cry* is the manner how the *run out of the classroom* event is realized. If only *Background* connects V_1 and V_2 in the V_1 *zhe* V_2 construction, then the manner modification between V_1 and V_2 in the V_1 *zhe* V_2 construction is not captured.

Then what is the additional appropriate rhetorical relation to connect V_1 and V_2 in the V_1 *zhe* V_2 construction so that the manner reading is captured? The hint comes from the position of V_1 in a sentence. In the V_1 *zhe* V_2 construction, V_2 is considered as the main verb and V_1 is located in the pre-verbal position.[2] The pre-verbal position is an unmarked position for adverbials in Chinese, cf. Li and Thompson (1981: 19-27). An adverbial can be considered as an elaboration on the manner (and others such as location, time, etc.) of the main verb. That is, V_1 is attached to V_2 in the V_1 *zhe* V_2 construction by *Elaboration*. *Elaboration* specifies that V_1 is temporally included in V_2, and this temporal relation is consistent with the temporal relation identified by *Background*.

In short, according to the default function of the durative *zhe* and the syntactic position of V_1 in the V_1 *zhe* V_2 construction, we propose that by default *Elaboration* and *Background* connect V_1 and V_2 in the V_1 *zhe* V_2 construction. These two rhetorical relations accurately explain the manner modification and the temporal relation between V_1 and V_2 in the construction. We state the default function as follows:

- Rule 2: Default Function of *zhe* in V_1 *zhe* V_2

  V_1 is connected to V_2 in the V_1 *zhe* V_2 construction by *Elaboration* and *Backgrond* unless stated otherwise.

One might be wondering how we can explain the difference between Rule 2 and Wu's

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[2] Li and Thompson's (1981: 223) idea also supports this generalization. They refer to V_1 in the V_1 *zhe* V_2 construction as a durative background. This proposal suggests that V_2 is a foreground, i.e. the most important information in a discourse, just like a main verb.

(2007a) proposal. Wu's (2007a) proposal is that the default function of an imperfective marker in Chinese is to indicate that a sentence with an imperfective marker is attached to another sentence or clause by *Background*, as shown by the default function of Rule 1 in Section 2. Why is there such a difference between Rule 1 and Rule 2?

We suggest that this is a difference between syntax and discourse. A discourse consists of sentences (or clauses). The sentences in a discourse do not have a fixed function. On the other hand, the syntactic positions in a sentence have (more or less) fixed functions. For example, an unmarked position for adverbials in Chinese is preverbal, although they can also occur at the sentence-initial position. The V_1 *zhe* V_2 construction is usually regarded as a sentence, which contains two verbs describing two events.[3] Since V_1 in the V_1 *zhe* V_2 construction occupies the unmarked position for adverbials in Chinese, it naturally has the function of an adverbial: it provides a temporal background and a manner how the main verb V_2 is performed.

One might suggest that Smith (1997) has proposed something similar to the default function in Rule 2. Smith (1997: 274) states that "…, -*zhe* appears in the subordinate clause of complex sentences. The imperfective viewpoint has a backgrounding effect, …" As a matter of fact, Hopper (1979) also proposes something of the similar effect. The difference between our proposal on the one hand and Hopper (1979) and Smith (1997: 274) on the other is that, in our proposal, the backgrounding effect of the imperfective viewpoint is a default function, which can be overridden when explicit information indicates otherwise. If the imperfective viewpoint could serve as a background only, then it would be extremely difficult to explain temporal advancement shown by the examples in (6).

Moreover, one might claim that the default function jeopardizes both '*Narration* default' and the directionality of *Elaboration*. *Narration* is default for bounded events, as discussed in Wu (2007b, 2010), and Smith's (2003: 26) proposal has a similar effect. However, Wu (2007b) discusses states among other situation types, and finds that the default function for states is *Background*. Wu (2007a) has a similar proposal for imperfective aspect markers. Smith (ibid) can be interpreted as stating that the narrative time fails to advance for unbounded events and states. That is, *Narration* is not default for all situation types and

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[3] Tai (1985) discusses similar phenomena. He proposes that the word order in Chinese matches the temporal order. His examples are similar to ours of the V_1 *zhe* V_2 construction: a single sentence contains two VPs expressing two events.

aspects. As for directionality of *Elaboration*, although Asher and Lascarides (2003) use examples where a latter sentence elaborates on a previous one, yet, as far as our knowledge goes, the key to infer *Elaboration* is a subtype relationship between two sentences, as discussed in Asher and Lascarides (2003: 206), and the directionality between the two sentences does not seem to play a role. Since, in examples such as (5), V_1 is a subtype of V_2, we conclude that V_1 elaborates on V_2.

Moreover, two questions can be asked, with respect to the function of preverbal position in Chinese: Are all preverbal VPs or PPs adverbials, such as V *le* V construction, pivotal construction and the *bei/ba* construction? Can adverbials form an independent sentence, such as *ta cixiangde kan-zhe wo* 'he looked at me kindly'? For the first question, we do not think that all preverbal VPs or PPs are treated as adverbials. The *bei/ba* construction cannot be treated as adverbials because *bei* and *ba* have already specified their syntactic functions. V *le* V construction describes two events that take place in sequence and hence neither functions as an adverbial for the other. For pivotal construction, the first verb can be considered as the matrix verb and the second as an embedded verb. Since this construction involves embedding of one verb under another, therefore neither of the verbs in the pivotal construction serves as an adverbial for the other. As for the second question, we do not think that adverbials such as *cixiangde* 'kindly' should be treated as an independent clause and connected to the verb by a rhetorical relation, because the semantic function of an adverbial is to modify an event. Although V_1 in the V_1 *zhe* V_2 construction serves as a manner for V_2, essentially V_1 is still an event and therefore it is connected to another event, i.e. V_2, by a rhetorical relation, instead of directly modifying the second event.

Finally, given that SDRT deals with rhetorical relations between sentences, one might be wondering whether SDRT can be generalized to intra-sentential phenomena such as the V_1 *zhe* V_2 construction discussed in this paper. Although, mostly, Asher and Lascarides (2003) discuss the rhetorical relations between sentences, they also talk about intra-sentential rhetorical relations. They (2003: 285) propose that a *that* clausal complement is connected to the matrix clause by *Elaboration*. Following Asher and Lascarides' (ibid) idea on the rhetorical relation between a matrix clause and a clausal complement, we propose that V_1 is connected to V_2 by rhetorical relations in the V_1 *zhe* V_2 construction.

Now let's discuss next question. The next question is under what circumstance V_1

temporally precedes V_2 in the V_1 *zhe* V_2 construction, as in (6). If we examine the examples in (6) carefully, we find temporal overlapping between V_1 and V_2 impossible. In (6a), the *drive* event and the *teach* event cannot occur at the same time: once the *teach* event starts, the *drive* event definitely has already stopped. In (6b), the *drag dead branches* event and the *throw the branches into the stove* event cannot be realized concurrently because once the branches are thrown into the stove, it is impossible to continue dragging them. In (6c), the *push the wheelchair* event cannot temporally overlap with the *go to the corridor* event because once the subject reaches the corridor, the pushing event stops. In other words, in those examples, V_2 imposes a final endpoint on V_1, just like how a telic event *hexiaqu* 'to drink down' poses a final endpoint on *qiao* 'to watch' in (4). In other words, only when V_2 provides a final endpoint for V_1 can V_1 and V_2 be connected by *Narration*. We can have a temporal constraint similar to the temporal constraint of Rule 1 for the V_1 *zhe* V_2 construction:

- Rule 3: Temporal Constraint of *zhe* in V_1 *zhe* V_2
  In the V_1 *zhe* V_2 construction, the narrative time of V_1 can be advanced if and only if V_2 imposes a final endpoint on V_1.

The temporal constraint of Rule 3 implies that a sentence of the V_1 *zhe* V_2 construction is temporally ambiguous if V_2 can temporally overlap with V_1 or impose a final endpoint on V_1. See the example below.

(7) Zhangsan qi-zhe jiaotache dao shichang mai dongxi
  Zhangsan ride-Dur bicycle to market buy stuff
  'Zhangsan rode a bicycle to the market and bought stuff.'
  Or, 'Zhangsan went to the market to buy stuff, riding a bicycle.'

The V_1 either temporally precedes or overlaps with V_2 in (7). That is, (7) can be used to describe two different scenarios. First, Zhangsan rode a bicycle to the market, got off the bicycle and bought stuff. Second, Zhangsan bought stuff at different vendors at the market and he rode his bicycle to the market and from one vendor to another. The first scenario is an example of temporal advancement between V_1 and V_2, while the second is an instance of

temporal overlapping. This ambiguity arises because in (7) V_2 can either impose a final endpoint on V_1 or not. If the second scenario can be ruled out somehow, then we can get an unambiguous example. See the one below.

(8) Zhangsan	qi-zhe	jiaotache	dao	chaoshi	mai	dongxi
Zhangsan	ride-Dur	bicycle	to	supermarket	buy	stuff

'Zhangsan rode a bicycle to the supermarket and bought stuff.'

It is usually not allowed to ride a bicycle to go from aisle to aisle in a supermarket. Therefore, (8) only has the reading that Zhangsan rode a bicycle to the supermarket, walked into the supermarket and bought stuff. That is, only a temporal advancement reading is allowed for (8) because the possibility for temporal overlapping is ruled out, i.e. a final endpoint has to be imposed on V_1 for cases such as (8).

Before going to the last issue, we would like to discuss a few potential questions. First, one might suggest that, if a final endpoint is involved in the temporal constraint, the question whether different situation types would lead to different temporal relations or interpretations cannot be neglected.

The idea is accurate that different situation types lead to different relations. As discussed in Wu (2007b), where the temporal relations between sentences with no aspect marker are examined, situation types play a significant role: a bound event is, by default, connected to the sentence following it by *Narration* and states are defeasibly attached to the sentence following it by *Background*.

Secondly, it seems that the temporal constraint of Rule 3 goes against Smith's (2003) anaphoric interpretation of tense in some way. Smith (2003: 94) proposes that, for states and progressives, the RT of the second sentence is identified with the RT of the first sentence, etc. Nevertheless, the examples in (6) show that the time of V_1 is advanced. Based on these examples, the temporal constraint of Rule 3 is called for.

Another question is whether the narrative time can be advanced in a state situation type. Wu (2007b: 86-91) discusses the possibility of *Narration* for states. He proposes that a stage-level state can be connected to the sentence following it by *Narration*, but there is no such possibility for individual-level states. He uses examples of the following types to

support his point.

(9) a. guowang   zhidao   you   ren   panbian

       King   learn   there.be   people   rebel

    'The king learned that someone had started a rebel.'

   b. like   caiqu   xingdong

    immediately   take   action

    '(He) immediately took action.'

   c. buguo   yijing   tai   chi   le

    but   already   too   late   Prc

    'But it was already too late.'

(10) a. zongtong   hen   zhongshi   zhe   ge   wenti

     President   very   take.seriously   this CL   problem

    'The president took this problem very seriously.'

   b. *ranhou/yushi   yaoqiu   xingzhengyuan   chuli

    then/so   ask   executive.yuan   take.care.of

    '*Then/So, he asked the Executive Yuan to take care of it.'

Zhidao 'to learn (that …)' is a stage-level state in Chinese because it goes with *le*, while *zhongshi* 'to take (something) seriously' is an individual-level state since it is not compatible with *le* (Lin 2000, Chang 2003, Wu 2005, etc). (9a–b) are connected by *Narration* because (9b) occurs in the past of (9a). But, in terms of temporal relations, unlike *Narration* that connects a bounded event to another sentence, *Narration* for a stage-level state indicates that a situation occurs in the past of the <u>initial</u> point of the state. That is, (9b) occurs in the past of the initial point of the *zhidao* 'to learn (that…)' event described by (9a).

On the other hand, an individual-level state does not allow for this possibility. In (10), *ranhou* 'and then' is a cue phrase that specifies *Narration*. Nevertheless, it cannot be used to connect (10b) to (10a), but *yushi* 'so', which specifies *Result*, can be used here. Wu (2007b: 93-94) suggests that an individual-level state expresses a permanent homogeneous state, which includes no obvious point to be followed.

One might point out the seeming contradiction between the default function of Rule 2 and the temporal constraint of Rule 3 since the former indicates temporal overlapping but the latter temporal advancement. But, there is no contradiction here. Rule 2 is a <u>default</u> function, which can be overridden when explicit information states otherwise. Providing a final endpoint for the event presented by the durative *zhe* explicitly indicates *Narration* and therefore the temporal constraint of Rule 3 overrides the default function of Rule 2.

Moreover, one might claim that the imposed final endpoint does not necessarily have to happen in reality and that the example in the above paragraph can be uttered when the subject is heading to the market without actually seeing him end up being there. We believe that it is sufficient for the temporal constraint of Rule 3 to function as long as the listener can infer that a final endpoint can be imposed. This phenomenon is similar to the examples of Imperfective Paradox (Dowty 1979) in that an event presented by the past progressive aspect can be safely inferred to have reached its natural final endpoint, unless stated otherwise. This is why the same temporal advancement reading can be detected even though we add *mingtian hui* 'tomorrow will' into the examples in (6).

The last issue is why there is no example of temporal reversal, i.e. V_1 temporally follows V_2 in the V_1 *zhe* V_2 construction. Tai (1985) proposes that the word order in a Chinese sentence matches its temporal order. This proposal can be interpreted as a constraint: the word order in a sentence cannot be reversal of the temporal order. When V_1 temporally follows V_2, the word order is the reversal of the temporal order. A clash surfaces.

Concerning the last issue, one might suggest that *Explanation* can override the Iconicity Principle. For example, in *jintian mei qu shangban, yinwei haizi shengbing* 'I did not go to work today because my child was sick', the order of the sentences does not match the temporal order. There are two points we would like to point out here. First, Tai (p.c) states that the Iconicity Principle is a default principle, that is, it can be overridden when explicit information states otherwise. In the example above, *yinwei* 'because' specifies the cause-effect relationship and therefore overrides the Iconicity Principle. Second, the Iconicity Principle is a principle for word order in Chinese. The example above shows that the Iconicity Principle is overridden in discourse, but it is not really a counter-example to our explanation since we are talking about word order of a sentence, not the order of

sentences in a discourse.

To sum up, we propose that the default function of *zhe* in the V_1 *zhe* V_2 construction is to indicate that V_1 and V_2 are connected by *Elaboration* and *Background*. Second, V_1 and V_2 can be connected by *Narration* if and only if V_2 imposes a final endpoint on V_1. Third, temporal reversal is not possible for the V_1 *zhe* V_2 construction because the Iconicity Principle proposed in Tai (1985) can be understood as a constraint, that is, the word order in a sentence cannot be the reversal of the temporal order.

3.2. An SDRT Account

In this section, we use SDRT to model the phenomenon we observe. First, we formalize the default function as an axiom and the temporal constraint as a meaning postulate. Second, we demonstrate how SDRT can derive the legitimate temporal relations.

We formalize the default function of Rule2 and the temporal constraint of Rule 3 as the following two axioms:

- Axioms for *zhe* in V_1 *zhe* V_2

  a. Default Function

    $(?(\alpha, \beta, \lambda) \wedge (V_1\ zhe\ V_2) \wedge zhe(V_1(\ldots))(\alpha) \wedge V_2(\ldots)(\beta) > (Elaboration(\beta, \alpha, \lambda) \wedge Background(\beta, \alpha, \lambda))$

  b. Temporal Constraint

    $(Narration(\alpha, \beta, \lambda) \wedge (V_1\ zhe\ V_2) \wedge zhe(V_1(\ldots, e_1))(\alpha) \wedge V_2(\ldots, e_2)(\beta))$

    $\leftrightarrow SigP(e_1) = prestate(e_2)$

In the axiom (a) above, > represents a non-monotonic inference, that is, an inference that can be overridden if explicit information says so. This axiom says that, in the V_1 *zhe* V_2 construction, V_1 is by default attached to V_2 by *Elaboration* and *Background*. The axiom (b) says the following. α represents V_1 *zhe* and β stands for V_2. If α is connected to β by *Narration*, then the Significant Point (SigP)[4] of V_1 is the prestate of V_2, that is, the initial point of V_2 is the final endpoint of V_1.

The meaning postulates to infer temporal relations specified by *Elaboration*/*Background*

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[4] A SigP roughly equals to the final endpoint of an event. Please refer to Wu (2005).

and *Narration* are adopted from Asher and Lascarides (2003: 163):

- Meaning Postulates for Inferring Temporal Relations

a. $\Phi_{Narration(\alpha, \beta)} \Rightarrow (\text{overlap}(\text{prestate}(e_\beta), \text{poststate}(e_\alpha)))$

b. $\Phi_{Elaboration(\alpha, \beta)} \Rightarrow (\text{part\_of}(e_\beta, e_\alpha))$

c. $\Phi_{Background_T(\beta,\alpha)} \Rightarrow (\text{overlap}(e_\beta, e_\alpha))$

The meaning postulate (a) says that if α and β are connected by *Narration*, the prestate of β temporally overlaps with the poststate of α, i.e. the initial point of β overlaps with the endpoint of α. The postulate (b) says that if the elaboration of α is β, then β is a temporal part of α. The postulate (c) basically says something similar to the postulate (b), i.e. temporal overlapping.

Next, let's see how the axioms and meaning postulates work. Two examples are repeated below for the purpose of demonstration.
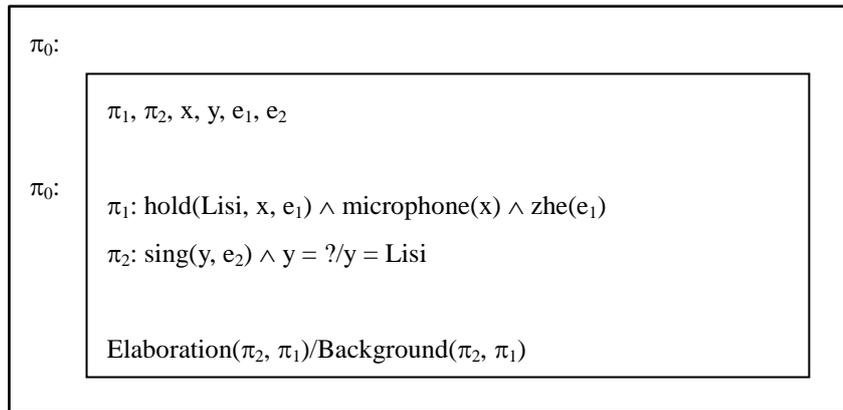
(11) a. Lisi   wo-zhe   maikefeng   changge

    Lisi   hold-Dur   microphone   sing

    'Lisi sang, holding a microphone.'

  b. Zhangsan   che-zhe   kuzhi   rengjin   huolu

    Zhangsan   drag-Dur   dead.tree.branch throw.in   stove

    'Zhangsan dragged the dead branches and threw them into the stove.'

- Glue Formulae for (11a, b)

a. π_1: hold(Lisi, x, e_1) $\land$ microphone(x) $\land$ zhe(e_1)

  π_2: sing(y, e_2) $\land$ y = ?

  ?(π_1, π_2)

b. π_1: drag(Zhangsan, x, e_1) $\land$ dead.branch(x) $\land$ zhe(e_1)

  π_2: throw.into(y, z, e_2) $\land$ y = ? $\land$ z = ?

  ?(π_1, π_2)

The glue formula (a) is for (11a). π_1 represents V_1, i.e. the *Lisi hold a microphone* event,

and π_2 stands for V_2, that is, the *sing* event. In addition, V_2 has an underspecified subject, represented as y =?. At this point, it is unknown which rhetorical relation connects π_1 and π_2, represented as ?(π_1, π_2). There is no information indicating which rhetorical relation connects π_1 and π_2, and π_2 does not impose a final endpoint on π_1. Therefore, the axiom (a) kicks in and specifies that π_1 is connected to π_2 by *Elaboration* and *Background*. This is represented as *Elaboration*(π_2, π_1) and *Background*(π_2, π_1) in the Segmented Discourse Representation Structure (SDRS) for (11a) below, which means that the elaboration and the (temporal) background of π_2 is π_1. Since π_2 is connected to π_1, the underspecified subject of π_2 is realized as the subject of π_1 because the subject of *sing* must be animate and hence cannot be *microphone*.

- SDRS for (11a)

π_0:

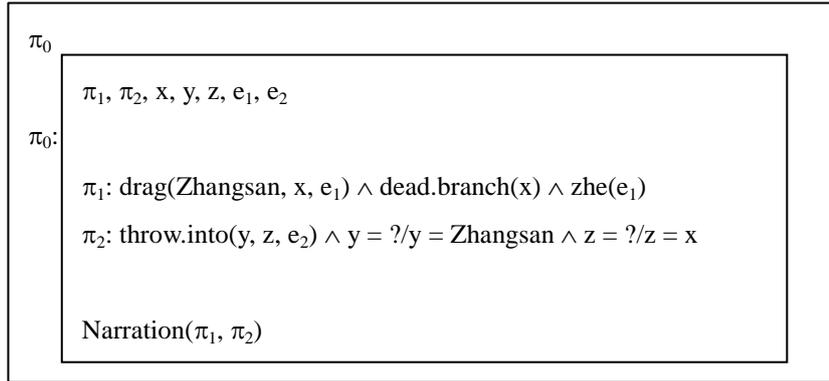|	
π_0:	$\pi_1, \pi_2, x, y, e_1, e_2$ π_1: hold(Lisi, x, e_1) $\wedge$ microphone(x) $\wedge$ zhe(e_1) π_2: sing(y, e_2) $\wedge$ y = ?/y = Lisi Elaboration(π_2, π_1)/Background(π_2, π_1)

Based on the meaning postulates (b, c), *Elaboration* and *Background* specify that temporal overlapping between two situations, that is, in SDRS for (11a), π_1 is temporally overlapped with π_2. This is how temporal overlapping is derived for the V_1 *zhe* V_2 construction for this example.

The glue formula (b) is for (11b). π_1 stands for the *Zhangsan drag dead branches* event and π_2 the *throw into the stove* event. Moreover, π_2 has an underspecified subject and direct object. In this example, the *throw into the stove* event poses a final endpoint on the *Zhangsan drag dead branches* event. The axiom (b) applies and indicates that *Narration* connects π_1 and π_2. In addition, the underspecified subject of π_2 is realized as the subject of

π_1 and the underspecified object of π_2 is identified with the direct object of π_1. The subject of *throw.into* must be animate and therefore it can be identified to the animate subject of π_1: Zhangsan. Since the direct object is not a reflexive, its antecedent cannot be Zhangsan, but dead branches. The SDRS for (11b) is formed as follows.

- SDRS for (11b)

$$\boxed{\begin{array}{l} \pi_0 \\[1em] \pi_0: \boxed{\begin{array}{l} \pi_1, \pi_2, x, y, z, e_1, e_2 \\[1em] \pi_1: \text{drag(Zhangsan, } x, e_1) \wedge \text{dead.branch}(x) \wedge \text{zhe}(e_1) \\ \pi_2: \text{throw.into}(y, z, e_2) \wedge y = ?/y = \text{Zhangsan} \wedge z = ?/z = x \\[1em] \text{Narration}(\pi_1, \pi_2) \end{array}} \end{array}}$$

According to the meaning postulate (a), *Narration* indicates that the temporal order matches the contextual order, that is, in SDRS for (11b), π_1 temporally precedes π_2. This is how temporal advancement is derived for the V₁ *zhe* V₂ construction.

In this section, we formalize the default function of *zhe* in the V₁ *zhe* V₂ construction and the temporal constraint. We also demonstrate how SDRT can derive the temporal overlapping reading and the temporal advancement reading for the V₁ *zhe* V₂ construction.

4. Conclusion

In this paper, we examine the temporal relations of the V₁ *zhe* V₂ construction. It has been observed that V₁ in the V₁ *zhe* V₂ construction serves as a durative background. We find that temporal advancement is also possible for the V₁ *zhe* V₂ construction. We propose that by default V₁ is connected to V₂ in the V₁ *zhe* V₂ construction by *Elaboraiton* and *Background* because V₁ functions both as a durative background and as a manner for V₂. We also argue that V₁ can be attached to V₂ by *Narration* when and only when V₂ imposes a final endpoint on V₁. No temporal reversal is possible for the V₁ *zhe* V₂ construction

because the Iconicity Principle (Tai 1985) can be interpreted as a constraint: the word order in a sentence cannot be reversal of the temporal order. We also demonstrate how SDRT can be used to derive the temporal readings for the V_1 *zhe* V_2 construction.

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