The Interpretation of Elliptical Predicate Constructions in Mandarin: Semantic Underspecification and Pragmatic Enrichment

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Abstract: This paper attempts to present a unitary account of a range of elliptical predicate constructions in Mandarin, such as Null Object Constructions, English-like VP ellipsis constructions, and gapping constructions. It is argued that (i) from an interpretative perspective, the ellipsis site in the above-mentioned elliptical constructions can be uniformly analyzed as a pro-form with underspecified content; (ii) the interpretation of both syntactically and semantically underspecified constructions as such is crucially dependent on context. Within the framework of Dynamic Syntax (Kempson et al. 2001; Cann et al. 2005), the null object in Null Object Constructions, the null verb phrase in English-like VP ellipsis constructions and the null verb in gapping constructions are consistently analyzed as projecting a metavariable whose semantic value is pragmatically enriched from context by means of "substitution"/"re-use". It is thus shown that syntactic and pragmatic processes interact to determine the underspecified content of elliptical predicate constructions in Mandarin. The dynamic analysis proposed provides a formal and unitary characterization of a variety of elliptical constructions without any stipulations.

1 INTRODUCTION

In this paper we attempt to provide a unitary account for a range of elliptical predicate constructions in Mandarin, such as Null Object Construction, English-like VP ellipsis, and Mandarin gapping construction, as exemplified by (1)-(3) below, respectively.

(1) 张三喜欢英语，李四也喜欢。
    Zhangsan xihuan yingyu. Lisi ye xihuan ([e]).
    Zhangsan like English Lisi also like
    'Zhangsan likes English. Lisi also likes (it).'
(2) [张三在爬树。]
    [*Zhangsan zai pashu*.]
    [Zhangsan ASP climb tree]
    ['Zhangsan is climbing a tree.']
    李四：我也敢。
    Lisi: *wo ye gan* ([e]).
       I also dare
       'So dare I.'
(3) 张三吃了三个苹果，李四四个橘子。
    Zhangsan chi-le san-ge pingguo, Lisi___si-ge juzi.
       Zhangsan eat-ASP three-CL apple Lisi__four-CL

orange
'Zhangsan ate three apples, and Lisi__four oranges.'

In (1), the object in the target clause of the Null Object Construction is apparently missing with the main verb repeated. English-like VP ellipsis presented in (2) is licensed by modals such as 会 (*hui*) 'will', 能 (*neng*) 'can', and 敢 (*gan*) 'dare'. The main verb in the gapping construction (3) is left unexpressed in the subsequent clause. The fact that syntactically underspecified constructions as such can be perfectly understood indicates that the ellipsis site is crucially dependent on context for its interpretation. Obviously, the constituents at issue can only be left out if there is a straightforward way for the hearer to recover their meanings from the context, be it linguistically (as in (1) and (3)) or non-linguistically (as in (2)).

The context-dependent nature of interpreting elliptical constructions suggests that the underspecified content associated with the unexpressed syntactic constituents requires to be pragmatically enriched. This points to a hypothesis that the elliptical site projects a meta-variable which takes its value from context, either from a linguistic

antecedent or the discourse context. The central thesis of this paper is that an adequate account of elliptical constructions should be couched in terms of semantic underspecification and pragmatic enrichment.

This paper is organized as follows. Section 2 presents a critical review of previous analyses of the elliptical constructions illustrated above. Section 3 introduces the theoretical framework to be employed, namely, Dynamic Syntax (Kempson et al. 2001; Cann et al. 2005). Section 4 presents a dynamic account of the constructions exemplified by (1)-(3). A summary is made in section 5.

2 PREVIOUS ANALYSES

As for Null Object Construction as (1), there are mainly two lines of analyses. One argues that there exists V-Stranding VP ellipsis (alternatively known as VP ellipsis in disguise) in Mandarin which can be differentiated from Null Object Construction (see Huang 1991a; Li 2002; Ai 2008 *inter alia*), whereas the other maintains that V-Standing VP ellipsis in Mandarin is actually nothing more than Null Object Construction (e.g. Xu 2003). V-Stranding VP ellipsis is derived through the deletion of VP after the main verb goes through V-to-v movement, with the main verb being stranded. The NP gap is no longer a null object, but an elided VP. Later, the moved verb has to be reconstructed back through Logical Form reconstruction (LF-reconstruction) to get a full semantic interpretation for the target clause.

Li (2002) points out that V-Stranding VP ellipsis in Mandarin should be approached from the perspective of verb types, which can be differentiated into stative verbs, resultative verbs and action verbs. Moreover, he mentions that in any given V-Stranding VP ellipsis contexts (e.g. under syntactic control), the aforementioned constructions show strict and sloppy readings[1], just like English-like VP ellipsis constructions. However, Ai (2008)

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[1]When the elliptical site includes a pronoun, the interpretation of the elliptical clause show strict and sloppy effect, as in the following example:

张三喜欢他的老师。

Zhangsan xihuan ta-de laoshi.

Zhangsan like his teacher

'Zhangsan likes his teacher.'

李四也喜欢。

Lisi ye xihuan__.

Lisi also like

Strict reading: 'Lisi also likes Zhangsan's teacher.'

Sloppy reading: 'Lisi also likes Lisi's teacher.'

argues against Li's statements, holding that Li's approach is of no significant results, and to have a linguistic antecedent (here to be under syntactic control) is not a guarantee that the target is an instance of VP ellipsis, because the target can also be an instance of deep anaphora in the sense of Hankamer and Sag (1976) (like *do it/that* anaphora). Moreover, he proposes that the traditional diagnostics for VP ellipsis such as the strict and sloppy ambiguity are not sufficient as *do it/that* anaphora also shows such traits. He believes that there do exist V-Stranding VP ellipsis constructions in Mandarin, but Li has looked at the wrong place for relevant arguments.

According to Ai (2008), examples like (1) are instances of V-Stranding VP ellipsis rather than Null Object Constructions, on the ground that if the construction at issue can tolerate pragmatic control (without linguistic antecedent), it might be an instance of Null Object Construction, while if it cannot, it must be an instance of V-Stranding VP ellipsis, an instance of VP ellipsis, which is typically known to resist pragmatic control. Having differentiated strong pragmatic control from weak pragmatic control in terms of the availability of a linguistic topic (if there is no linguistic topic, it is an instance of strong pragmatic control; if there is one, it is an instance of weak pragmatic control), he further argues that genuine V-Stranding VP ellipsis in Mandarin can be found only in places of strong pragmatic control when the null object happens to be [-animate]. As pointed out by him, [-animate] null objects resist strong pragmatic control as in (4):

(4) [Zhangsan drives home in his new BMW].

Lisi [to his wife]:

#我一点儿都不喜欢。

Wo yi-dian-er dou bu xihuan[NP Ø].

I one-bit all not like

'I do not like (it) at all.'

(it=Zhangsan's new BMW)

(Ai 2008: 108, (37))

Though appealing, this account does not seem to be on the right track, both theoretically and empirically. Theoretically, the diagnostic of pragmatic control for VP ellipsis constructions does not hold in Mandarin, different from that in English[2]. As a piece of evidence, example (2) can well tolerate pragmatic control. Empirically, the [±] animate property of the null object does not make a

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[2]As mentioned in Hankmaer and Sag(1976), VP ellipsis constructions in English resist pragmatic control, as in the example below:

[Hankamer attempts to stuff a 9-inch ball through a 6-inch hoop]

Sag: #It's not clear that you will be able to.

difference in the acceptability of relevant utterances according to my informants, that is, the acceptability of (4) and (5) is equal.

(5)[Zhangsan walks home in his new adopted husky].

　　Lisi [to his wife]:

　　我一点儿都不喜欢。

　　Wo yi-dian-er dou bu xihuan[NP Ø].

　　I　　one-bit　all　not　like

　　'I do not like (it) at all.'

　　(it=Zhangsan's new adopted husky)

　　(Ai, 2008: 109, (38))

Moreover, according to Ai's analysis, we would reach the conclusion that the elliptical site in (4) is derived through VP deletion after the main verb 喜欢 (*xihuan*) 'like' goes through V-to-v movement, whereas the elliptical site in (5) can be either a deictic pro or a referential null epithet, for instance, the covert counterpart of 那玩意儿 (*na wanyi-er*) 'that play thing'. The same structure is imposed with two distinct derivation and interpretation processes, which are far from satisfactory. Apparently, a more unified and consistent analysis remains to be achieved. In this paper, we follow Xu (2003) and maintain that examples like (1) are nothing more than Null Object Constructions.

As for the derivation and interpretation of English-like VP ellipsis as (2) in Mandarin, there are mainly two approaches proposed in the literature: Phonetic Form deletion (PF deletion) (see Huang 1991b, 1997; Ai 2008 *inter alia*) and Logical Form reconstruction (see, e.g. Li 2005). While the former assumes a full-fledged syntactic structure for the VP gap prior to Spell-Out, the latter assumes that the gap is a base-generated pro-form of VP and its content, including its syntactic structure, can be fully reconstructed at the Logical Form. Following Huang (1991b, 1997), the derivation of English-like VP ellipsis in Mandarin can be represented as:

　　Subject$_i$ (Neg) modal/auxiliary [$_{vP}$…[$_{vP}$ t$_i$…]] (Ai 2008)

After the subject is extracted out of the ellipsis site, the remaining element, namely, vP, is deleted, which can be illustrated by (6) below.

(6) [$_{IP}$ 张三 $_i$ 敢 [$_{vP}$ t$_i$ [$_{VP}$ 爬树]]], [$_{IP}$ 我 $_j$ 也敢[$_{vP}$ t$_i$ [$_{VP}$ 爬树]]].

　　[$_{IP}$Zhangsan$_i$ gan [$_{vP}$ t$_i$ [$_{VP}$ pa shu]]],[$_{IP}$ Wo$_j$　ye gan [$_{vP}$ t$_i$ [$_{VP}$ pa shu]]].

　　[$_{IP}$Zhangsan$_i$ dare [$_{vP}$ t$_i$ [$_{VP}$ climb tree]]], [$_{IP}$ I$_j$ also dare [$_{vP}$ t$_i$ [$_{VP}$ climb tree]]].

　　'Zhangsan dare to climb a tree, so dare I.'

The other approach in the literature is Logical Form reconstruction (LF-copy). The target VP is considered to be base-generated as a pro-form of VP that has no structure after Spell-Out. For the interpretation of the target elliptical clause, the relevant VP in the antecedent clause has to be copied into the gap. Li (2005) holds that the existence and the meaning of the base-generated pro-form are determined by the selection property of a head. Only the constituents selected by the head can exist as empty elements, for instance, modals select VP:

(7) 小明能讲英语，小红也能。

　　X*iao Ming neng jiang yingyu, Xiao Hong ye neng*[e].

　　Xiao Ming can speak English Xiao Hong also can.

　　'Xiao Ming can speak English, so can Xiao Hong.'

The head 能 (*neng*) 'can' selects a VP, therefore, in (7) the VP 讲英语 (*jiangyingyu*) 'speak English' is selected by the head 能 (*neng*) 'can' and can exist as an empty element. Though appealing at first sight, this approach can only deal with limited VP ellipsis materials. The gapping example (3) is left unexplained, as what is not overtly expressed is the head.

(3) illustrates the structure of gapping, in which the main verb is null in the subsequent clause. Gapping in English, as shown in (8), is traditionally analyzed as (VP-) ellipsis with VP deletion after the target object being moved out of the relevant VP at the Phonetic Form, or across the board V/VP movement (see Johnson 1994, 2004, 2006, 2009).

(8) John likes apples and Mary __oranges. (Ai 2014: 125, (1))

Tang (2001) assumes that examples like (8) are simply empty-verb sentences rather than instances of gapping. Recently, Ai (2014) has proposed a different analysis of English-like gapping constructions in Mandarin. He takes issue with both Johnson's and Tang's analyses. With respect to Johnson's across-the-board-movement analysis, Ai (2014: 128) claims that it fails to account for English-like gapping in Mandarin, because gapping in Mandarin is not restricted to coordinate structures, nor does it seem to obey typical island constraints. Regarding Tang (2001)'s assumption, Ai argues instead that empty verb sentences have a rather limited distribution in Mandarin, and the "reconstructed" verbs in empty-verb sentences do not have to be identical, a case being different from gapping, an instance of ellipsis, for which "identity" is always the licensing condition. Adopting a methodology that separates the target clause from

the antecedent clause, Ai (2014: 131) contends that English-like gapping in Mandarin "is nothing more than multiple sentence fragments, formed by a series of syntactic operations that involve topicalization, focus movement, and IP-deletion", as shown in (9a) whose interpretation is shown in (9b) and (9c):

(9a) 问：那天在山上，他们都看见了谁？

Q: *Natian zai shan-shang, tamen dou kanjian-le shei?*

　　that.day on mountain-above　they all see-ASP who

'(Lit.) That day on the mountain, they all saw whom?'

答：(?)张三看见了淑芬。李四亚萍。

A: (?)*Zhangsan kanjian-le Shufen. Lisi　Yaping.*

　　Zhangsan see-ASP Shufen Lisi Yaping

　　'Zhangsan saw Shufen and Lisi　　Yaping.'

Ai (2014: 126, (5))

(9b) [$_{TopicP}$Lisi$_i$[$_{FocusP}$Yaping$_j$[$_{IP}$t$_i$ *kanjian-le* t$_j$]]]

(focus movement)

(9c) [$_{TopicP}$Lisi$_i$[$_{FocusP}$Yaping$_j$[~~$_{IP}$t$_i$ *kanjian-le* t$_j$~~]]]

(PF deletion)

Ai (2014: 133, (26))

Under Ai's analysis, the first NP, namely the subject, is topicalized and moved from spec, IP to spec, TopicP position. Prior to the topicalization of 李四 (*Lisi*), the second NP 亚萍 (*Yaping*) undergoes leftward focus movement to spec, FocusP position, which is above IP but below TopicP. Subsequently, as shown in (9c), the remnant IP [t$_i$kanjian-le t$_j$] is then deleted at the Phonetic Form, yielding (9a), which should be notated as "张三看见了淑芬。李四亚萍[$_{IP}$＿＿]" ("*Zhangsan kanjian-le Shufen. Lisi, Yaping[$_{IP}$＿＿]*") 'Zhangsan saw Shufen and LisiYaping[$_{IP}$＿＿]' with the gap indicating an IP that has been elided.

Ai's proposal has, however, a few problems under closer examination. First, given the observation of given-before-new ordering of information that has long been recognized, the subject and object of two coordinate clauses supposedly carry the same information function in the sense that the subject NP usually presents the given information, and the object NP the novel information. Under Ai's analysis, the subject NP and object NP in the target clause undergo topicalization and leftward focus movement, respectively. If Ai's analysis is on the right track, the antecedent clause should undergo the same syntactic operations. This would give rise to a distinct structure "*张三淑芬看见了，李四亚萍" ("*Zhangsan Shufen kanjian-le,

Lisi Yaping") '*Zhangsan Shufen saw and Lisi Yaping'. Moreover, by extension, the generation of all canonical subject-predicate-object structures would involve such complex syntactic operations as topicalization and focus movement, which does not seem viable.

Second, the leftward focus movement of the object is not properly motivated. In canonical Mandarin sentences the object usually carries the natural focus information as observed in Chao (1968: 69-78). Thus, in (3) 张三吃了三个苹果，李四四个橘子 (*Zhangsan chi-le san-ge pingguo, Lisisi-ge juzi*) 'Zhangsan ate three apples and Lisi four oranges', 三个苹果 (*san-ge pingguo*) 'three apples' and 四个橘子 (*si-ge juzi*) 'four oranges' are located in the position of informational focus, which suggests that the leftward focus movement of the object should not be justified. Even there exists a focus position that is above IP and below TopicP under certain context, there should not be any justification for the leftward movement of the object in gapping constructions to that position, because it is not the only position available for focus. The object that remains in situ is originally the natural focus, which can become the contrastive focus when it is phonologically stressed, namely, without movement (see Cheng 2008).

To sum up, from an interpretive perspective, all the analyses reviewed here fail to provide an adequate and consistent account for the various elliptical predicate constructions in Mandarin, simply because their production as well as their interpretation is context-dependent in nature. Therefore, a proper analysis for elliptical constructions should be one that places a high premium on context, that is, one that can show how syntactic processes interact with pragmatic processes to determine the underspecified content of the elliptical constructions.

In this paper we attempt to propose a uniform, parsing-based account of the various elliptical predicate constructions discussed above: Null Object Constructions, English-like VP ellipsis and gapping construction. From a parsing perspective, the both syntactically and semantically underspecified constituents can be enriched by contextual information. The theoretical framework to be employed is that of Dynamic Syntax (henceforth DS, Kempson et al. 2001; Cann et al. 2005), which is a grammar formalism that defines both representations of content and context dynamically and structurally and allows the interaction between syntactic, semantic and pragmatic information. Before presenting a DS account of elliptical

constructions in Mandarin, we provide a brief introduction to the relevant parts of the framework needed for handling the constructions discussed above.

3 THE DS FRAMEWORK

The DS paradigm seeks to develop a grammar formalism for characterizing the structural properties of language by modeling the dynamic process of semantic interpretation which is defined over the left–right sequence of words uttered in context. What is distinct about this theory is that syntactic explanations can be grounded in the time-linear projection of the requisite predicate-argument structure. Like Minimalism (Chomsky 1995), there is only one significant level of representation, namely Logical Form. Unlike Minimalism, logical forms are representations of semantic content, i.e. pure representations of argument structure and other meaningful content.

The design of the DS model reflects a number of significant observations. First, natural language understanding is highly dependent on context and the change of context is not merely sentence by sentence, but also word by word. Second, processing, like other cognitive activities, involves manipulation of partial information. This model extends incomplete specifications from semantics and pragmatics to the domain of syntax, and thus allows the interaction between three types of actions, computational, lexical and pragmatic, in the parsing process. Intrinsic to this process is the concept of underspecification, both syntactic and semantic, which is manifested in a number of different ways and whose resolution is driven by the notion of requirements (i.e. goals and subgoals) which determine the process of tree growth and must be satisfied for a parse to be successful. The critical aspect for the DS account will be the interaction between these three types of actions, all of which are expressed in the same terms of tree growth, hence freely allowing interaction between them. Since this interaction is important to the case to be made, we briefly introduce the vocabulary of tree growth decorations and the way it captures the concept of progressive tree growth.

3.1 Requirements and Tree Growth

The starting point is to build a tree the root node of which is the goal of interpretation formalized as a universal requirement $?Ty(t)$, where ? indicates the requirement, the label Ty the type and its value t the type of a proposition. To satisfy such a requirement, a parse relies on information from three sources. First, there are computational rules that give templates for the building of trees. A pair of general computational rules called Introduction and Prediction allow a tree rooted in $?Ty(Y)$ to be expanded to one with an argument daughter $?Ty(X)$ and a predicate daughter $?Ty(X{\to}Y)$, reflecting the functor/argument status of the typed, lambda logic employed. By this rule, the minimal tree with the initial requirement $?Ty(t)$ can be expanded to a partial tree as in Fig. 1, where the diamond is the 'pointer' which is used to identify the particular node under construction, here the external argument or subject node.
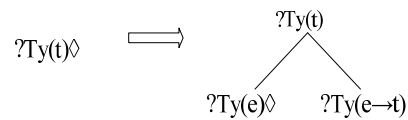

Figure 1: An initial expansion.

Second, information about tree building may come from actions encoded in lexical entries, which are accessed as words are parsed. Take a canonical sentence 张三喜欢英语 (*Zhangsan xihuan yingyu*) 'Zhangsan likes English' as an example. A lexical entry for the word 张三 (*Zhangsan*) contains conditional information initiated by a trigger (the condition providing the context under which subsequent development takes place), a set of actions (here involving the annotation of a node with type and formula information) and a failure statement (an instruction to abort the parsing process if the conditional action fails). The lexical specification further determines, through the annotation $[\downarrow]\perp$, the so-called 'bottom' restriction, that the node in question is a terminal node, a general property of contentive lexical items[3].

(10) Lexical entry for *Zhangsan*:

　IF　　$?Ty(e)$

　THEN　put(Ty(e), Fo(ι, x, Zhangsan'(x)), $[\downarrow]\perp$))
　ELSE　abort

The information derived from parsing 张三 (*Zhangsan*) provides an annotation for the external

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[3]In the DS framework, proper names are treated as projecting iota terms, where an iota term is construed as an epsilon term with an associated unique choice function that picks out only that object identified by the name (see Cann et al. 2005; Wu 2011).

argument node and thus satisfies the requirement on that node for an expression of Type (e). Then the pointer moves on to the predicate node as shown in Fig. 2.
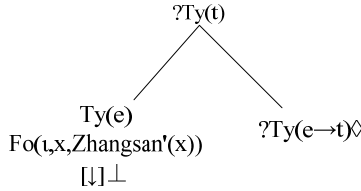
$?Ty(t)$

$Ty(e)$
$Fo(\iota,x,Zhangsan'(x))$
$[\downarrow]\perp$

$?Ty(e{\rightarrow}t)\diamond$

Figure 2: Pasring "Zhangsan".

Lexical entries may make reference to nodes in the tree other than the trigger node, either building them or annotating them, by employing a few instructions such as 'make', 'put', 'go', which have obvious interpretations. To formulate both computational and lexical actions in these terms, DS adopts The Logic of Finite Trees (LOFT), a modal logic for describing finite trees. This logic is central to the DS framework and utilizes a number of operators of which the following are used in this paper:

$\langle\downarrow\rangle$ $\langle\downarrow_0\rangle$ $\langle\downarrow_1\rangle$ $\langle\uparrow\rangle$ $\langle\uparrow_0\rangle$ $\langle\uparrow_1\rangle$ $\langle L\rangle$

These modalities are interpreted by a discrete relation between the nodes in a tree: $\langle\downarrow\rangle$ is evaluated over the daughter relation, so $\langle\downarrow_0\rangle$ and $\langle\downarrow_1\rangle$ mean an argument daughter and a functor daughter below a certain mother node respectively; conversely $\langle\uparrow\rangle$ over the mother relation, thus $\langle\uparrow_0\rangle$ and $\langle\uparrow_1\rangle$ mean an argument daughter and a functor daughter of a certain mother node respectively; $\langle L\rangle$ is evaluation over a relation of "LINK" pairing two trees. The way LOFT operators are used can be demonstrated in the lexical entry for 喜欢 (*xihuan*) 'like' in the above Chinese sentence.

(11) Lexical entry for *xihuan*:

    IF $?Ty(e{\rightarrow}t)$

    THEN make($<\downarrow_1>$), go($<\downarrow_1>$), put(Fo(xihuan'),

          $Ty(e{\rightarrow}(e{\rightarrow}t))$),$[\downarrow]\perp$);go($<\uparrow_1>$),

          make($<\downarrow_0>$), go($<\downarrow_0>$), put($?Ty(e)$)

    ELSE Abort

The pointer is manipulated by the lexical actions to annotate different nodes. Firstly, it moves from the predicate node of $?Ty(e{\rightarrow}t)$ to the top node $?Ty(t)$ where the present tense information is annotated, then returns to the open predicate node. Then the lexical semantics of the transitive verb 喜欢 (*xihuan*) 'like' takes action: it not only licenses

the building of a two-place predicate node, but also that of an internal argument daughter with a requirement to construct a formula of Type (e). After the parse of the verb, the pointer moves to the $?Ty(e)$ node, indicating that this is to be developed next. The tree in Fig. 3 represents the parse state where both the subject and the verb have been parsed.
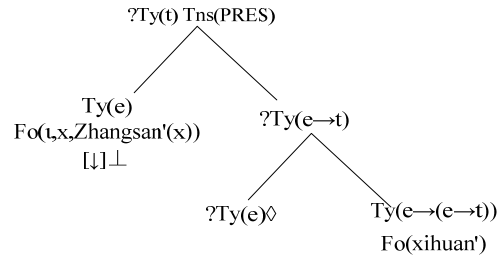
$?Ty(t)\ Tns(PRES)$

$Ty(e)$
$Fo(\iota,x,Zhangsan'(x))$
$[\downarrow]\perp$

$?Ty(e{\rightarrow}t)$

$?Ty(e)\diamond$

$Ty(e{\rightarrow}(e{\rightarrow}t))$
$Fo(xihuan')$

Figure 3: Parsing "Zhangsan xihuan" ('Zhangsan likes').

Finally, the object NP 英语 (*yingyu*) 'English' is parsed to satisfy the open term requirement in the internal argument position, the processing of which is the same as that of the subject NP 张三 (*Zhangsan*). The parsing process is not yet complete, however, as some requirements on the tree remain to be satisfied. Completion of the tree involves functional application of functors over arguments, driven by modus ponens over types, yielding expressions which satisfy the type requirements associated with intermediate nodes (the rules in question are called Completion and Elimination, the former noting modal statements of type decorations, these then triggering the construction of the appropriate lambda term at the mother). Fig. 4 shows the completed tree the top node of which is decorated with a propositional formula value representing the final result of interpreting the utterance.
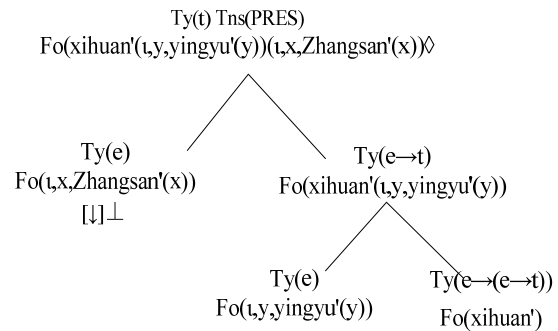
$Ty(t)\ Tns(PRES)$
$Fo(xihuan'(\iota,y,yingyu'(y))(\iota,x,Zhangsan'(x))\diamond$

$Ty(e)$
$Fo(\iota,x,Zhangsan'(x))$
$[\downarrow]\perp$

$Ty(e{\rightarrow}t)$
$Fo(xihuan'(\iota,y,yingyu'(y))$

$Ty(e)$
$Fo(\iota,y,yingyu'(y))$

$Ty(e{\rightarrow}(e{\rightarrow}t))$
$Fo(xihuan')$

Figure 4: Parsing "Zhangsan xihuan yingyu" ('Zhangsan likes English').

3.2 Anaphoric Expressions

As mentioned above, DS also allows pragmatic actions during the parsing process, which can be illustrated by the processing of anaphoric expressions. Assuming the general stance that words provide lexical actions in building up representations of content in context, we can say that anaphoric expressions such as pronouns may pick out some logical term if that term is provided in the discourse context. This sort of semantic underspecification is treated in the DS model as involving the articulation of anaphoric expressions as projecting a metavariable to be replaced by some proper representation. Put another way, anaphoric expressions can be construed via a placeholder which must be replaced by either some selected term from the context or by some term given in the construction process. Such a replacement is established through a pragmatically driven process of **substitution** which applies as part of the parsing process.

Considering the processing of pronouns such as *she* and *him* in the English utterance *George likes Gillian, but she doesn't like him*. In parsing the first pronoun *she*, the subject node created by the rules of Introduction and Prediction (that induce subject–predicate structure for the conjunct clause) is first decorated with a metavariable U_{female}, with an associated requirement $?\exists x.Fo(x)$, to find a contentful value for the formula label, as shown in (12).

(12) IF?   Ty(e)
     THEN   put(Ty(e), Fo(U_{female},$?\exists x.Fo(x)$, $[\downarrow]\bot$)
     ELSE   abort

Construed in the given context, substitution will determine that the metavariableU_{female}can only pick out the logical term*Fo (Gillian'*) established in the first clause, since *she* requires to be identified with a referent that is female or that can be attributed with female properties. Zero anaphors (e.g. null subjects and null objects) can be dealt with in the similar fashion. The null object projects a matevariable, whose value can be enriched from the context. Essentially it is a pragmatically driven process of substitution. We will illustrate the parsing processes of null objects in section 4.

3.3 Linking Trees

To underpin the full array of compound structures displayed in natural languages, DS defines a license to build paired trees, so called Linked trees, which

are associated by means of the LINK modality, <L>. This device is utilized for allowing incorporation within a tree of information that is to be structurally developed externally to it, a mechanism used for characterizing adjuncts of various types. The modalities are <L>, <L⁻¹> and the former points to a tree linked to the current node while the latter naturally points backward to that node. The link adjunction rule is illustrated as following:

Link Adjunction Rule additionally imposes a requirement on the new linked structure that it should contain somewhere within it a copy of the formula that decorates the head node from which the Link relation is projected. This rule encapsulates the idea that the latter tree is constructed in the context provided by the first partial tree, which thus cannot operate on a type-incomplete node and ensures that both structures share a term. Relative clause is one core case analyzed employing linking trees. Besides that, we can see later in this paper that linking tree structure plays a significant role in the interpretation of ellipsis constructions.

3.4 Ellipses and Context

DS is promising in the account of ellipsis constructions, including those without linguistic antecedents. This is because it abandons the entrenched idea that context is irrelevant to syntax and provides a general characterization of such process that is blind to whether the triggering context is internal or external to the sentence (see Cann et al. 2007). As we mentioned, we should place a high premium on context when dealing with elliptical constructions. Then, we have to make it clear: what is context? The context defined in DS provides a record of (a) the partial tree under construction with its semantic labels, (b) the trees provided by previous utterances and (c) the sequence of parsing actions used to build (a) and (b). Moreover, context can be both linguistically and non-linguistically. Therefore, divergent ellipsis patterns can be explained under this approach, as context is defined as a record of both structures and procedures used in building up such structures, by either re-using context-recorded content, or re-using structure, or context-recorded actions[4] (see Cann et

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[4]The bonus of analyzing context as involving not only previous content but also structures and actions used in building up these structures can be found in the characterization of the strict and sloppy effect mentioned in footnote 1. Copying content from context results in the strict reading while copying the action processes used in the antecedent clause leads to the sloppy reading.

al. 2007; Gregoromichelaki et al. 2012 ; Gregoromichelaki et al. 2013; Gregoromichelaki & Kempson to appear; Kempson et al. to appear).

4   A DYNAMIC ANALYSIS

As is pointed out in section 2, the Mandarin elliptical predicate constructions are underspecified in content, and their interpretations are crucially dependent on context. In the DS system, the elliptical site projects underspecified content that is represented by a metavariable, which may be postulated for any type: for a Type (e) for the null object in Null Object Construction as in (1), a Type (e→t) for the null verb phrase in English-like VP ellipsis as in (2), and a Type (e→(e→t))for the empty verb in gapping construction as in (3). Therefore, the elliptical sites in these constructions can be uniformly analyzed as a placeholder which requires enrichment for interpretation to occur, through the interaction between syntactic processes and pragmatic processes. In the case of a pronoun, the content of the metavariable associated with it is instantiated by a process of substitution for interpretation, usually by a term established in the previous discourse, as demonstrated in the preceding section. As far as Mandarin elliptical predicate constructions (1)-(3) are concerned, the hearer has to identify the potential substituend for the metavariable from the context. Therefore, with a dynamic analysis of elliptical site as projecting a metavariable and a technical tool for identifying its content value from context, we should be able to characterize Mandarin elliptical predicate constructions in a somewhat straightforward way.

4.1   Null Object Construction

Let us first consider the Null Object Construction (1), repeated here as (13), where the object in the subsequent clause is unexpressed.

(13) 张三喜欢英语，李四也喜欢。

Zhangsan xihuan yingyu. Lisi ye xihuan ([e]).
 Zhangsan like English Lisi also like
‘Zhangsan likes English. Lisi also likes (it).’

The interpretation of the antecedent clause 张三喜欢英语 (*Zhangsan xihuan yingyu*) ‘Zhangsan likes English’ is illustrated in section 3 as shown in Fig. 4, repeated here as Fig.5. Introduction and Predication rules allow a root tree to be expanded to one with an argument node and a predicate node. The subject 张三 (*Zhangsan*) is parsed and decorates

the argument node with a formula value. The lexical information of the transitive verb 喜欢 (*xihuan*) ‘like’ builds a two-place predicate node (and annotates it) and an internal argument node. 英语 (*yingyu*) ‘English’ is processed and annotates the internal argument node with a formula value.
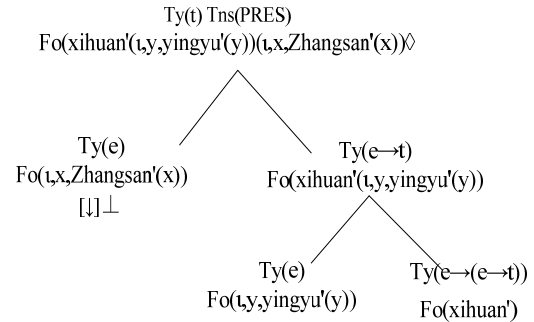

Figure 5: Parsing "Zhangsan xihuan yingyu" (‘Zhangsan likes English’).

When parsing the elliptical clause, 李四 (*Lisi*) is successfully parsed and duly decorates the subject node with a formula value. The next lexical item to be processed is however not a predicate as usually expected, but instead a predicate adjunct 也 (*ye*) ‘also/too’ which can be assigned Ty((e→t)→(e→t)). After the predicate modifier is processed, the pointer moves to the one-place predicate node, permitting the parse of the regular verb 喜欢 (*xihuan*) ‘like’, whose lexical actions further project a two-place predicate node decorated by *Fo(xihuan')* and an internal argument node with requirements to be satisfied. The parsing process is shown in the right tree below in Fig.6, linked to the context tree in the left through the technical tool "LINK" mentioned earlier in the paper.
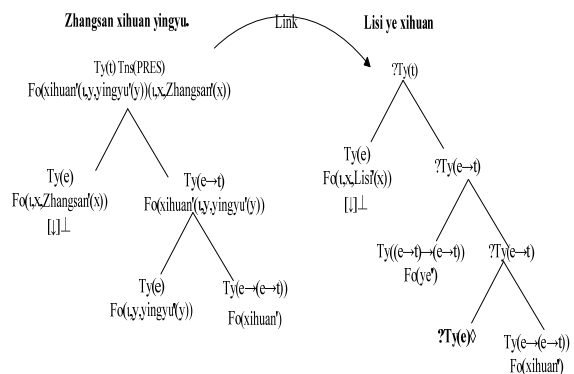

Figure 6: Parsing "Lisi ye xihuan" (‘Lisi also likes’).

At this point, the tree cannot be completed because there still remains an outstanding formula

requirement on the internal argument node, which requires a Ty(e) element. With no further strings input, the internal argument is in its null form, which projects a metavariable Fo(V), whose value needs to be enriched from context.

(14) Actions for *the null object*:
    IF   ?Ty(e)
    THEN put(Fo(V), ?∃x.Fo(x))
    ELSE Abort

Subsequently, the pragmatic process of **substitution** targets a node from the tree in the context, selects a Ty(e) formula value and writes it to the node decorated by the requirement ?Ty(e). The double arrow indicates the pragmatically constrained operation of **substitution** between the linked trees. After this pragmatic process, the requirement on the internal argument node is replaced by some contentful concept *Fo(yingyu')*. The parsing process is illustrated in Fig.7, completion of which will give rise to a propositional

formula:*Fo(xihuan'(yingyu')(Zhangsan'))∧Fo(ye'(xihuan'(yingyu'))(Lisi'))*.
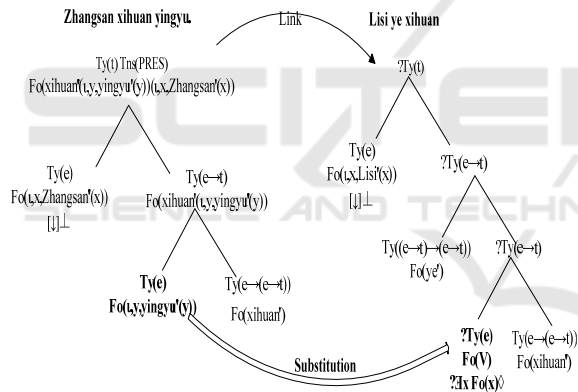

Figure 7: Parsing the null object.

4.2 English-like VP Ellipsis

We now turn to English-like VP ellipsis construction (2), repeated here as (15), which is licensed by modal verbs such as 敢 (*gan*) 'dare', 会 (*hui*) 'will', 能 (*neng*) 'can' and so on[5].

(15) [张三在爬树。]
    [*Zhangsan zai pashu*.]
    [Zhangsan ASP climb tree]

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[5]The syntactic licensing condition for English-like VP ellipsis, namely, the restrictions on modal verbs that can license English-like VP ellipsis constructions, is not concerned here, which will be addressed in another papecr.

    ['Zhangsan is climbing a tree.']
李四：我也敢。
Lisi: *wo ye gan([e])*.
    I also dare
    'So dare I.'

The contextual utterance in (15) 张三在爬树 (*Zhangsan zaipashu*) 'Zhangsan is climbing a tree' is parsed in a normal way, with the term projected by the subject NP 张三 (*Zhangsan*) decorating the subject node, 在 (*zai*) as an aspect marker signalling the progressive continuous tense, and 爬 (*pa*) 'climb' projecting a two-place predicate node (and decorating it) and an internal argument node. The term projected by the object NP 树 (*shu*) 'tree' finally decorates the internal argument position, yielding a well-formed tree structure as shown in Fig.8.
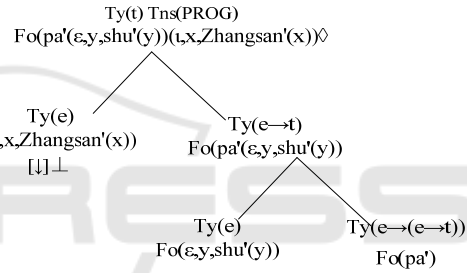

Figure 8: Parsing "Zhangsan zai pa shu" ('Zhangsan is climbing a tree').

We now turn to the parse of the current utterance 我也敢 (*wo ye gan*) 'I dare too'. As for the pronoun 我 (*wo*) 'I', it projects a metavariable Fo(V), whose value can be substituted by "the speaker". 也 (*ye*) 'also/too' is an adjunct of Ty((e→t)→(e→t)). As is widely observed, modal verbs have certain semantic contents, expressing the speaker's opinions or feelings towards the action verbs following them, namely, they modify the verbal phrase subsequent to them. Modals cannot be used alone as predicates, though they can license ellipsis constructions under certain context (with linguistic or pragmatic antecedent). Therefore, modals such as 敢 (*gan*) 'dare' can also be analyzed as a modifier of Ty((e→t)→(e→t)).The parsing process is illustrated in Fig.9.

At this point, all words in the clause have been processed, yet the tree cannot be completed because the one-place predicate node, though type-complete, has an outstanding requirement for a formula value. With no further strings input, the one-place predicate
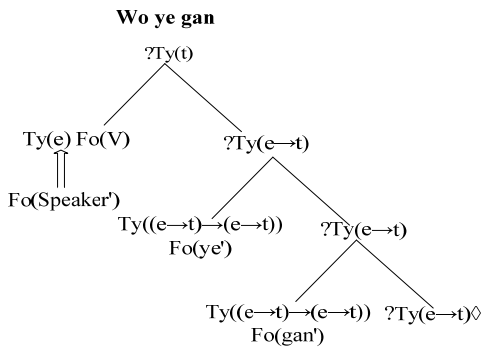
Figure 9: Parsing "wo ye gan" ('So dare I').

node is in its null form, which projects a metavariable Fo(V), whose value needs to be enriched from context.

(16) Actions for *the null verbal phrase*:

IF   ?Ty(e→t)

THEN put(Fo(V), ?∃x.Fo(x))

ELSE Abort

The need for a contentful Ty(e→t) predicate structure can then be satisfied through the enrichment from context, employing the pragmatic tool **substitution**. In the context of (15), the only possible substituend for the pro-predicate is the term *Fo(pa'(ε,y,shu'(y)))* projected by the preceding verbal phrase. Subsequently, the value of the null verbal phrase is therefore established, through an update provided by the discourse context, parallel to the process of the null object in Null Object Construction. The parsing process is shown in the tree in Fig.10, completion of which will give rise to a propositional formula *Fo(ye'(gan'(pa'(ε,y,shu'(y))))(ι, x, Lisi'(x)))*.
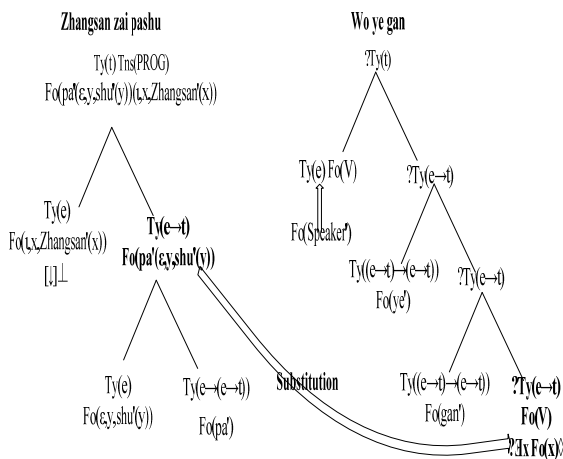
Figure 10: Parsing the null verbal phrase.

A dynamic analysis of the null verbal phrase as

projecting a metavariable and a technical tool for identifying its content from the context, we provided a somewhat straightforward way to characterize English-like VP ellipsis constructions.

4.3   Gapping

Finally, let us consider how gapping constructions in Mandarin can be characterized. Consider example (3), repeated here as (17).

(17) 张三吃了三个苹果，李四四个橘子。

Zhangsan chi-le san-ge pingguo, Lisi___si-ge juzi.

Zhangsan eat-ASP three-CL apple Lisi__four-CL orange

'Zhangsan ate three apples, and Lisi__four oranges.'

The dynamic parsing of this construction is straightforward, without any stipulation. The parsing of the antecedent clause 张三吃了三个苹果 (*Zhangsan chi-le san-ge pingguo*) 'Zhangsan ate three apples' basically has the same story as that of 张三喜欢英语 (*Zhangsan xihuan yingyu*) 'Zhangsan likes English'[6]. In the subsequent clause, the pointer moves to the predicate node after the initial expression 李四 (*Lisi*) is successfully parsed and duly decorates the subject node with a formula value. However, the next lexical item coming in sequence is not a predicate as usually expected, but instead an object NP. As the antecedent clause, namely, the context, is about eating something, we can sense immediately that the verb in the subsequent clause is not lexically realized, which can be analyzed as projecting a predicate metavaribale Fo(U), whose actions can be characterized as below (18). Its value needs to be enriched from context, parallel to that of the metavariable projected by the null object in Null Object Construction and the predicate pro-from projected by the null verbal phrase in English-like VP ellipsis construction.

(18) Actions for *the null verb*

IF   ?Ty(e→t)

THEN make(<↓₁>), go(<↓₁>), put(Ty((e→(e→t)), Fo(U), ?∃x.Fo(x)); go(<↑₁>), make(<↓₀>), go(<↓₀>), put(?Ty(e))

ELSE abort

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[6]The slight difference between these two utterances exists in the noun phrases. The former contains a numeral phrase, the quantity expression of which are usually represented by ε（epsilon operator）terms.

The open requirement of a contentful value *?∃x.Fo(x)* at this predicate node can be satisfied through a straightforward copying of the Ty(e→(e→t)) formula value *Fo(chi')* from the context. In other words, the not-overtly expressed verb in the subsequent clause can be easily recovered by the verb in the antecedent clause 吃 (*chi*) 'eat'. The parsing process is illustrated in the tree structure in Fig. 11, the completion of which will give rise to a complete formula value *Fo(chi'(ε,y,juzi'(y))(ι,x,Lisi'(x)))*.
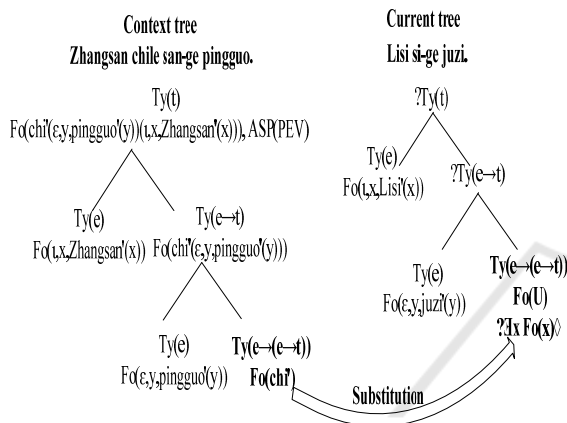

Figure 11: Parsing "Lisi_si-gejuzi" ('Lisi_four oranges').

5 SUMMARY AND CONCLUSION

In this paper we have presented an account of a range of Mandarin elliptical predicate constructions, namely, Null Object Construction, English-like VP ellipsis and gapping constructions. Within the DS framework, which defines both representations of content and context dynamically and structurally, the elliptical predicate constructions are treated uniformly in the way that the underspecified contents are all enriched pragmatically from the context through the process of **substitution**. The null object in Null Object Construction, the null verb phrase in English-like VP ellipsis as well as the null verb in gaping construction are consistently analyzed as a metavariable, projecting nodes with underspecified semantic contents which are informationally updated from context. The context involves local (as in (1) and (3)) as well as extra-linguistic content (as in (2)). It is thus shown that syntactic and pragmatic processes interact to provide a straightforward and unitary characterization for a variety of elliptical predicate constructions in Mandarin, without any stipulation.

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