Composite Event Structures and Complex Predicates
A Template-based Approach to Argument Selection

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RECENT STUDIES ON COMPLEX PREDICATES, SUCH AS BAKER’S (1988) THEORY OF INCORPORATION AND LI’S (1990) FEATURE PERCOLATION ACCOUNT, INVOLVE SYNTACTIC MANIPULATIONS BASED ON HEADED STRUCTURES. THIS PAPER PROPOSES A RADICALLY DIFFERENT APPROACH WHERE COMPLEX PREDICATE FORMATION IS RESOLVED MORPHOLEXICALLY WITH MAPPING BASED ON PROTOTYPICAL ARGUMENT TEMPLATES. OUR STUDY GIVES A MORE SATISFACTORY ACCOUNT OF COMPLEX PREDICATIVES EPRESENTING COMPOSITE (I.E. NON EMBEDDING) EVENT STRUCTURES.

Baker’s syntactic account of compounding relies crucially on the premise that the first verb subcategorizes the second verb (phrase) and hence could license head-movement and incorporation. However, this approach leads to problematic cases. For instance, Li (1990a) observes that not all heads of complements can be incorporated.

(1) a. Musa a-li-m-pik-ish-a mke wake chkula
    Musa he-past-her-cook-cause-ind wife his food
    ‘Musa made his wife cook come food.’

b. Na-ju-a kama Hamisi a-na-ogop-a giza
    I-know-ind that Hamisi he-pres-fear-ind darkness
    ‘I know that Hamisi is afraid of the dark.’

The two Swahili examples show that while the complement is $\theta$-marked by the verb ju ‘to know’, its head is never incorporated to form a compound. Thus, even in a structure-based theory of complex predicates, the behavior of compounding cannot be predicted by structural terms alone.

Furthermore, this account does not always work even when morphological incorporation does take place. Alsina (i. p.) argues with Chichewa data that causatives can be a three-place predicate, where
causee is an argument of both the causative predicate and the base predicate. (2) shows that a raising predicate cannot form a complex predicate with the causative predicate. This can be explained in Alsina’s theory because the subject of a raising predicate is non-thematic and hence cannot play the role of causee. The incorporation theory cannot account for this fact because it does not allow for three-place causatives. The causee argument would be \( \theta \)-marked by both the base predicate and the causative predicate and violate the Theta Criterion.

(2) a. Zi-ku-onek-a kuti nyani a-na-pony-a mipira

8s-PR-appear-FV that la baboon 1s-PS-throw-FV 3ball pa tsindwi
16 5roof

‘It appeared that the baboon threw a ball on the roof.’

b.*Njovu i-ku-onek-ets-a kuti nyani
9elephant 9s-PR-appear-CST-FV that la baboon
a-na-pony-a mipira pa tsindwi
1s-PS-throw-FV 3ball 16 5roof

‘The elephant makes it appear that the baboon threw a ball on the roof,’

Pretheoretically, complex predicates do not necessarily involve headed structures where a predicate governs the other predicate by subcategorizing for it or structurally commanding it. We will show in this paper that the so-called VR (Verb-Resultative) compounds in Mandarin involve composite instead of headed structures.¹ We will argue that this kind of complex predicate is better accounted for with a separate argument selection process which should be part of the morpholexical module.

I. Mandarin VV compounds: the data

Mandarin resultative compounds ([\(V_1-V_2\)]\(V_r\)) are composed by simply concatenating two predicates. They exhibit complicated argument selection and argument sharing facts.
(3) a. \([V_1 \text{ (intr)}-V_2 \text{ (intr)}]V_r \text{ (intr)}\)

\textit{Lisi ku-lei-le}
Lisi cry-BE+tired-PERF
‘Lisi cried such that s/he is tired.’

b. \([V_1 \text{ (intr)}-V_2 \text{ (intr)}]V_r \text{ (tran)}\)

\textit{Lisi ku-shi-le zhentou}
Lisi cry-BE+wet-PERF pillow
‘Lisi cried such that the pillow is wet.’

(4) \([V_1 \text{ (tran)}-V_2 \text{ (intr)}]V_r \text{ (tran)}\)

a. \textit{Wusong da-si-le laohu}
Wusong beat-die-PERF tiger
‘Wusong beat the tiger to death.’

b. \textit{Lisi wan-ni-le bangqiu}
Lisi play-bored-PERF baseball
‘Lisi got bored of playing baseball.’

c. \textit{lunwen xielao-le ta (from Tan 1990)}
thesis write-old-PERF s/he
‘Thesis wrote her/him old. (lit.)’

(5) \([V_1 \text{ (intr)}-V_2 \text{ (tran)}]V_r \text{ (tran)}\)

\textit{Laoshi zou-jin-le jiaoshi}
teacher walk-enter-PERF classroom
‘The teacher walked into the classroom.’

(6) \([V_1 \text{ (intr)}-V_2 \text{ (tran)}]V_r \text{ (tran)}\)

\textit{Sheng-fangji ting-dong niao-yu}
St. Francis listen-understand bird-language
‘St Francis listens and understands bird-talk.’

(7) Ta (tinantian ti qiu) ti-puo-le ta –de qiu-xie
s/he day-day kick ball tick-break his/her sneaker
‘(lit.) S/he kick-break her/his sneaker (because s/he plays soccer everyday).’
Sentences in (3)-(7) show that the transitivity of a resultative compound \( V_r \) is not determined by either \( V_1 \) or \( V_2 \). In addition, resultative compounds have the valence of either one or two, similar to the restriction in English that a resultative construction cannot have more than two arguments (Goldberg 1992). However, since both \( V_1 \) and \( V_2 \) can contribute either one or two arguments, the total number of available arguments varies from two to four. Thus sharing of arguments can occur in either subject (pre-verbal) position (3a and 4b), object (post-verbal) position (4a, 4c, and 5), or both positions (6). However, this does not mean all available arguments are represented. (7) shows that the patient argument of \( V_1 \) is suppressed. The argument sharing facts in terms of the thematic roles they play in each contributing predicate are given in (8). Bear in mind that thematic roles are used as convenient denominators in this article. It will be clear later in this paper that we take semantic properties of a role, rather than role names, as primitives.

\[
\text{(8) } \quad V_r\text{-subject} \quad V_r\text{-object}
\]

- a. (cf. 3a) \(< V_1 \text{agent} + V_2 \text{theme}>\)
- b. (cf. 3b) \(< V_1 \text{agent}, V_2 \text{theme}>\)
- c. (cf. 4a) \(< V_1 \text{agent}, V_2 \text{theme} + V_1 \text{patient}>\)
- d. (cf. 4b) \(< V_1 \text{agent} + V_2 \text{theme}, V_1 \text{patient}>\)
- e. (cf. 4c) \(< V_1 \text{patient}, V_1 \text{agent} + V_2 \text{theme}>\)
- f. (cf. 5) \(< V_1 \text{agent} + V_2 \text{theme}, V_2 \text{loc/goal}>\)
- g. (cf. 6) \(< V_1 \text{exp.} + V_2 \text{exp.}, V_1 \text{theme} + V_2 \text{theme}>\)
- h. (cf. 7) \(< V_1 \text{agent}, V_2 \text{theme}>? V_1 \text{patient}\)
Based on the above facts, we can approximate two generalizations about Mandarin VV compounds. The first is that $V_1$ contributes the first argument of $V_r$ while $V_2$ contributes the second argument. This generalization is violated by (8d), where the second argument comes from $V_1$. The second generalization is that the first argument of $V_r$ is always agent-like while the second argument is patient-like. This generalization, again, is violated by one exception in (8e). We will show later in this paper that the two generalizations are indeed the generalizations to be captured, and that the exceptions can be independently accounted for.

Semantically, the Mandarin resultative complex predicates differ from previously studied complex predicates because they involve composite structures rather than headed structures, such as the causative constructions. Take (7) above for example. In the situation described by the sentence, the sneaker becomes worn and broken as a consequence of the actor playing soccer, but not as an intended result. In other words, the sentence does not entail that the kicker is kicking at or with the sneakers to wear them out. Thus, the act described by $V$ neither controls the result described by $V_2$, nor is the actor of $V_1$ the causer in the standard sense as the actor of the abstract predicated CAUSE. This is further supported by the following sentences:

(9) a. $ni$ zai jixu quan ta liuxia,
   you again continue advise s/he stay
   $jiuyao$ quan-zou ta le
   about-going-to advise-go-PERF –her/him inchoative
   ‘If you continue to advise her/him to stay (so persistently etc.), you will have persuaded her/him to leave (pretty soon).’

b. bie zheme dasheng shu, ni shu-xing baobao le
   Don’t such loud hush you hush-awake baby LE
   ‘Don’t hush so loud, you are hushing awake the baby.’

Both (9a) and (9b) show that the event structure of these compounds
cannot be reduced to a traditional causative predicate because the result denoted by the $V_2$ phrase is actually an event contrary to the contextually or lexically entailed effect of $V_1$. In sum, we have shown that the event structure represented by the resultative complex predicates are composites of the event structures of $V_1$ and $V_2$. The relationship between the two events is neither lexically encoded like a causative, nor controlled by any head predicate.

The above discussion clearly shows that the resultative compounds differ from the incorporation cases in that none of the two base predicates take a VP headed by the other as an argument. They also differ from the so-called serial verb cases studied in Baker (1989) in that the argument-sharing facts are not determined by any of the base predicates. Thus it has been convincingly argued, by Li (1990b) and Lin (1990) respectively, that the Mandarin $VV$ compounds cannot be accounted for with Head-movement accounts of either incorporation or Head-Licensing. We will adopt their conclusions and only discuss other alternative accounts.

II. Failure of Previous Accounts

Thompson (1973) established that the Mandarin resultative compounds involve lexical rules. However, it was not until recently that linguists proposed theories to predict the interesting but complicated argument changing process of these compounds. In this section, we will show that Li’s (1990b) structure-based account, the best articulated theory of resultative compounds so far, fails to correctly predict the possible argument structures of these compounds. We will also briefly discuss two semantics-based accounts.

Li’s (1990b) account adopts three theoretical premises and one language-specific assumption. The assumption that $V_1$ is the head of the compound is made with neither argument nor supporting evidence. We will also show that such a postulation fails to lead to a satisfactory account. The three theoretical premises that Li adopts are:
\(\theta\)-identification, \(\theta\)-grid, and head feature percolation. The \(\theta\)-marking convention according to Theta Criterion in the GB framework would only allow one \(\theta\)-role per argument. Therefore the adoption of the-identification theory is necessary to allow more then one role to be identified, and thus be jointly assigned to an argument position later. Li also adopts Grimshaw’s (1990) theory of \(\theta\)-grid to represent lexical argument structures hierarchically. These hierarchical structures are then manipulated by the head feature percolation principles. It is crucial for Li’s account that \(\theta\)-prominence of the alleged head (\(V_1\)) is inherited by the compounds.

Li’s (1990b) account faces both theoretical and factual problems. The theoretical problem concerns the stipulation that-head percolation involves \(\theta\)-prominence, but not other well-established head properties, such as Case-assignment. His account also never addresses how the abstract concept of ‘\(\theta\)-prominence’ is represented and percolated without involving the whole thematic structure and the thematic roles contained.\(^2\) In addition, one would naturally assume within the GB theory that the Case-assignment property of the head will also be inherited. But this is not true, as we have shown that the transitivity of \(V_1\) does not follow from that of either \(V_1\) or \(V_2\). This difficulty means that the account fails to predict that resultative compounds allow at most two (non-oblique) arguments, and that the number of arguments a \(V_r\) takes sometimes conflicts with the number of arguments taken by the alleged head.

Although this account allows most possible predicate-argument structures for resultative compounds, it also over-generates and fails to select the correct readings among possible readings. In the following examples, we will adopt Li’s (1990b) notations. The \(\theta\)-prominence of a thematic structure is represented by Arabic numerals and the thematic roles of \(V_2\) is superscripted with primes to differentiate them from those governed by \(V_1\).

(11) \[\text{Baoyu qi-ku-le} \quad \text{Daiyu}\]

Baoyu anger-cry-PERF Daiyu

‘Baoyu angered Daiyu such that Daiyu cried.’
<1-1’, 2> but *<1-1’, 2>

(12)  
Baoyu kan-guan-le  Jiaoda  
Baoyu see-accustomed+to-PERF  Jiaoda  
‘Baoyu got used to seeing Jiaoda.’  
<1-1’, 2> but *<1-1’, 2>

Li’s account requires that the \( \theta \)-prominence of the head (\( V_1 \)) be preserved. Thus, as long as the argument hierarchy of \( V_1 \) is maintained, the reading is predicted to be grammatical. Unfortunately, as shown is (11) and (12), only one of the predicted readings is actually allowed.

(13)  
zhezhang qiu  da-kua-le  women-de shiqi  
this-CL ball-game play-collapse-PERF  our morale  
‘(lit.) This game destroyed our morale.’  
<2, 1’> ?1

(14)  
ta  ti-pou-le  qiu-xie (cf. 6)  
S/he kick-break-PERF sneaker  
‘S/he kicked (played soccer etc.) such that her/his sneakers are broken.’  
<1, 1’> ?2

On the other hand, this account also under-generates the data. In (13), the agent of the verb \( da \), i.e. the most prominent \( \theta \)-role of \( V_1 \), is not represented. Thus \( V_r \) does not maintain the \( \theta \)-prominence of its alleged head, violating the principles postulated by Li. Yet (13) is perfectly grammatical and is indeed the only possible reading. Similarly, the \( \theta \)-prominence of \( V_1 \) is violated in (14) because the second prominent argument of \( V_1 \) is not represented. (4c) discussed earlier is another clear violation. Li’s theory would wrongly rule out all three sentences.

In summary, Li’s (1990b) assumption that \( V_1 \) is the head is unsupported, his account fails to demonstrate how the percolation of \( \theta \)-prominence works, and we also showed that it makes erroneous predictions about the argument structures of resultative compounds in
spite of well-established theoretical premises. This result suggests that there is something fundamentally wrong about this formulation of a structure-based approach to resultative compounds.

On the other hand, semantics-based approaches have not succeeded in offering totally satisfactory accounts yet either. Lin’s (1990) account requires specific algorithms for each subclass of resultative compounds in order to generate thematic structures for them. The prediction is generally correct but begs the question of the exact nature of morpholexical rules and independent motivations for the subclassifications. Similarly, Chang’s (1990) account presupposes another subclassification system as well as the *a priori* knowledge of the co-referential relations among the candidate roles. Their relative success, when compared with the many counterexamples to Li’s account, does underline the semantic nature of resultative compounding.³

Ⅲ. Theoretical Foundation: The Lexical Mapping Theory and Argument Selection

Since the resultative compounds share identical surface encoding of argument structures with other verbs (<subj> or <subj, obj>), we propose that $V_r$’s undergo the same mapping between thematic and argument structures (Bresnan and Kanerva 1990). Unlike simplex predicates, however, the mapping of $V_r$ involves selecting roles from two thematic structures which are concatenated but not adjoined in a hierarchical way. In other words, our morpholexical module will determine which roles from each thematic structure are represented in the complex predicate before the grammatical representation of the complex predicate is determined. We adopt Huang’s (1992) *Autonomous Morphology Hypothesis* to allow the compounding process to access thematic roles from each base predicate.

\[(15)\]  *Autonomous Morphology Hypothesis:*

APARTICIPATING ARGUMENT OF A DERIVED CATEGORY MUST BE GOVERNED BY AN ARGUMENT STRUCTURE ENCODED ON THE LOCUS OF THE MORPHOLOGICAL OPERATION.
The **Autonomous Morphology Hypothesis** allows participating arguments to be selected from argument structures of each participating element in the morpholexical process, regardless of their structural status. Since the morphology of VV compounding involves concatenating $V_1$ and $V_2$, both of them can contribute to the argument structure of the compound under this hypothesis.

Furthermore, we need to show how the composite event structures are converted to a simplex thematic structure that can be mapped to lexical predicate-argument structures. Most theories of thematic roles take thematic structures as given, without attempting to specify how they are derived, although they would mention an underlying conceptual structure (e.g. Van Valin 1990). We will assume that there is an underlying conceptual representation shared by all languages. These conceptual structures are abstracted as event structures (e.g. Pinker 1989) as the first step towards linguistic representations. Arguments are selected from these event structures to form thematic structures. We will claim that language may differ in how they abstract form conceptual structures to thematic structures. The following representation of this view of grammar, based on the theory LFG (Bresnan and Kanerva 1989), is slightly adapted from the one given in Huang (1991).

(16) Conceptual Structure

   Argument selection-1

   Thematic Structure ~ Morpholexical
   | < - - - Lexical Mapping ~

   (Lexical) Predicate-Argument Structure

The necessity to postulate an argument selection process between conceptual and thematic structures can be shown with the contrast in how languages encode concepts differently. We will first look at the minimal pair of English *persuade* and Mandarin *quan*.

(17) a. persuade <agent , theme , event>  
    -- > event$_1$ CAUSE event$_1$

where event$_1$ is ADVISE<i, j, event$_2$k>,

where event$_2$ is PREDICATE$_k$j, ..>
ex. Mary persuaded John to quit smoking.
b. quan <agent , theme , event>
   -- > ADVISE<i, j, k>,
   where event is PREDICATE<j, ..>
ex. *Zhangsan quan Lisi jieyan
   Zhangsan advise Lisi quit-smoke\n   ‘Zhangsan tried to persuade Lisi to quit smoking.’

As shown above, even though 
perse uade and quan have identical
thematic structures and the identical control relation among their
thematic roles, they encode very different event structures. English
perse uade is an achievement verb that entails success of the persuas ion.
On the other hand, Mandarin quan is an activity verb where no such
entailment is available. On the other hand, two seemingly identical
conceptual structures can have different grammatical representations in
two different languages, as in the case of Mandarin die and English fall.

(18) a. fall<theme>
   ex. John fell.
b. die<theme, LOCgoal>
   ex. Zhangsan die (dao/zai) di-shang
   Zhangsan fall (to) ground-top
   ‘Zhangsan fell (to the ground).’
   comp. *Zhangsan die-le

Even though there is no reason to assign different event structures for
the two predicates of falling, they do lexicalize differently in English and
Mandarin. The location/goal argument is required in Mandarin but not in
English. Similarly, Alsina (1992) argues convincingly that the causee
argument in languages like Chichewa is an argument of the causative
predicate, while it is not for languages like English. Assuming that the
causativization is a universal concept, the difference of two types of
causative predicates can only be attributed to argument selection, or the
abstraction of thematic structures from conceptual structures. To
summarize, we have shown with contrasts in three languages that there
is no strict one-to-one correspondence between thematic structures and
the event structures they represent. A theory of argument selection
between conceptual structures and thematic structures is non-trivial.
IV. A Morpholexical Theory of Argument Templates

We propose that arguments are selected from the participants of event structures and mapped to thematic structures by argument selection process. Since conceptual structures allow greater variations than the more restricted set of argument structures in natural languages, we postulate that there are a small set of prototypical argument templates serving as the targets of argument selection. For simplex event structures, there is usually a close correspondence between the participants of the event structure and the selected templates. For composite event structure, however, since the event structure itself is not strictly hierarchical, the mapping is non-trivial. We propose that there are two prototypical argument templates which serve as the targets: the accusative template and the unaccusative template.

(19) **The Accusative Template**
[Proto-Agent, Proto-Patient]

(20) **The Unaccusative Template**
[Proto-Patient]

We claim that (19) and (20) are the only two prototypical templates required in VV compounding. The unergative argument structure arises when the object of an accusative verb is suppressed and need not be stipulated with argument selection. The accusative template is the proto-typical template for transitive verbs. The resultative compounds fall in the prototype of transitive verbs defined in previous literature (e.g. Pinker 1989), where a sentient actor acts on a patient which is affected by the act. They differ from the more familiar prototypical transitive verbs only in that two predicates are explicitly involved in the event. Thus, the accusative template is motivated by the fact that the resultative compounds fit its prototypical semantic constraints. Moreover, the fact that resultative compounds have at most two arguments follows from the fact that there are no other prototypical templates available for resultative verbs.

We will next propose the *Argument Selection Principles* governing the mapping from composite event structures to the thematic structures of VV compounds.
(21) **Argument Selection Principle for Composite Predicates**

*The ONE-TO-ONE Mapping Principle*

A) ONLY ONE ARGUMENT CAN BE CHOSEN FROM EACH PARTICIPATING EVENT STRUCTURE. (ONE-PER-ARGUMENT-STRUCTURE)

B) EACH ARGUMENT CAN ONLY BE LINKED TO ONE ARGUMENT POSITION IN A PROTOTYPICAL ARGUMENT TEMPLATE.

C) UN-LINKED ARGUMENTS ARE OPTIONALLY FUSED WITH A PROTOTYPICAL ARGUMENT ONLY IF THEY MEET THE SELECTIONAL RESTRICTION OF THE LINKED ARGUMENTS.

Like standard definition of function mapping, we define the mapping to be One-to-One. Once we adopt the interpretation of the accusative template as a prototype for transitive verbs, the semantic constraints of the template entail that the actor argument comes from the act predicate \(V_1\) while the acted-upon argument comes from the result predicate \(V_2\). Hence the approximate generalization observed earlier, regarding the contribution of \(V_1\) and \(V_2\) to the argument structure, is captured. Other argument linking facts follows directly from formal definition of function mapping. For the unaccusative template, since there is only one argument position to map to, both roles contributed by \(V_1\) and \(V_2\) must have theme-like properties and must be co-referential.

(22) **Mapping to the Accusative Template**

\[
\begin{array}{c|c}
V_1 & V_2 \\
\hline
\text{[Proto-Agent, Proto-Patient]} \\
\end{array}
\]

(23) **Mapping to the Unaccusative Template**

\[
\begin{array}{c|c}
V_1 & V_2 \\
\hline
\text{[Proto-Patient]} \\
\end{array}
\]

The next issue concerns selection of the Proto-Roles. Our Proto-Roles are defined following Dowty (1991) In other words, arguments in each contributing predicate will be examined based on their Proto-Role properties to determine which has the most Proto-Agent or Proto-Patient properties.
(24) **Proto-Agent Properties** (Dowty 1991.572. (28))

A. VOLTIONAL INVOLVEMENT IN THE EVENT OR STATE  
B. SENT [I] ENCE (AND/OR PERCEPTION)  
C. CAUSING AN EVENT OR CHANGE OF STATE IN ANOTHER PARTICIPANT  
D. MOVEMENT (RELATIVE TO THE POSITION OF ANOTHER PARTICIPANT)  
(E. EXIST INDEPENDENTLY OF THE EVENT NAMED BY THE VERB)

(25) **Proto-Patient Properties** (Dowty 1991.572. (28))

A. UNDERGOES CHANGE OF STATE  
B. INCREMENTAL THEME  
C. CAUSALLY AFFECTED BY ANOTHER PARTICIPANT  
D. STATIONARY RELATIVE TO MOVEMENT OF ANOTHER PARTICIPANT  
(E. DOES NOT EXIST INDEPENDENT OF THE EVENT OR NOT AT ALL)

Once a prototypical argument template is filled, the remaining arguments from either lexical structure can be fused with the selected arguments based on semantic restrictions (selectional or contextual). An argument that is not linked because of semantic restrictions will be suppressed.

In conclusion, the thematic structure in this theory is the result of argument selection. Arguments are selected lexically and language dependently. The lexical mapping theory takes the result of argument selection and maps it to lexical predicate-argument structure representations. Predicates with complex event structures (including compounds and accomplishment and achievement verbs) undergo the same argument selection process, where arguments may be selected from event structures of more than one base predicate.

V. **Deriving Argument Structures with Argument Selection**

In this section, we will show that our theory of argument selection generate all and only the grammatical readings of the VV compounds. We will start with the more straightforward case of (4a).
(26) a. $V_1$ <agent, theme> $V_2$ <theme> da-si ‘beat-die’
(cf. 4a) 
\[\begin{array}{c}
\langle\text{Proto-agent, Proto-patient}\rangle
\end{array}\]

In sentences like (4a), the agent of the verb da clearly has more Proto-Agent properties than its theme. It is therefore selected as the Proto-Agent of the compound $V_r$. On the other hand, there is only one argument of the $V_2$ si ‘to die’ and it is patientlike, therefore it is selected as the Proto-Patient of $V_r$. The unlinked theme of $da$ satisfies the semantic restrictions of the Proto-Patient, therefore it is optionally fused with it. Thus, with the accusative template, ‘A da-si B’ means that A beats B and as a consequence B dies. Similar VV compounds with this template include da-ku ‘beat-cry’, mai-guang ‘sell-be+gone’, etc.

The sentence (5) underlines an interesting contrast between our theory and a theory that regards thematic roles as atomic. Here, it is the loc/goal argument of $V_2$, instead of the theme role, that is selected as the Proto-Patient of $V_r$, contrary to the atomic view that themes is one of the most prototypical patientlike roles.

(27) $V_1$ <agent> $V_2$ <theme, loc/goal> zou-jin ‘walk-enter’
(cf. 5) 
\[\begin{array}{c}
\langle\text{Proto-agent, Proto-patient}\rangle
\end{array}\]

However, when Dowty’s theory of Proto-Role properties is applied, we find that the loc/goal argument does have more attested Proto-Patient roles. The theme of the verb jin ‘to enter’ has the Proto-Agent properties of movement and sentience, but has no Proto-Patient properties. On the other hand, the loc/goal argument has a Proto-Patient property: stationary, but no roto-Agent property. Thus the prediction is born out. V compounds with similar argument structures include: pao-shang ‘run-top’, ie-rul ‘fall-enter’, etc.

Next, we will show how our theory accounts for the cases problematic for precious accounts.
(28) \( V_1 <\text{agent, patient}> V_2 <\text{theme}> \) \( ti-uo \) ‘kick-break’

\[
\begin{array}{c}
\text{<Proto-agent, Proto-patient>}
\end{array}
\]

\( a. \) ta ti-puo-le ta-de qiu-xie

\[=7\]

s/he kick-break his/her sneaker

‘(lit.)S/he kick-break her/his sneaker (e.g. because s/he plays soccer everyday).’,

\( b. \) ta ti-puo-le puoli-men

s/he kick-break glass-door

‘S/he kicked and broke the glass door.’

The Proto-Role selection in (28) is identical to those in (26). To allow for the reading of (28a), however, the optional linking of the unselected role cannot occur, and the theme of \( V_1 \) will be suppressed. In our current account, the optional linking of the unselected argument is either contextually or lexically determined. This is supported by the fact that, given a different context, such as in (28b), the Proto-Patient role will be interpreted as co-referential with the object of \( V_1 \) ’s patient. This account enable us to maintain that there is only one transitive verb \( ti-uo \), while allowing the optional co-referential reading to be contextually enforced. VV compounds whose coreferential reading is obligatory, such as \( chi-\text{guang} \) ‘eat-be+gone’, will be lexically specified.

(29) \( V_1 <\text{agent, patient}> V_2 <\text{theme}> \) \( ti-uo \) ‘kick-break’

\[
\begin{array}{c}
\text{<Proto-patient>}
\end{array}
\]

ex. qiu-xue ti-puo-le

sneaker kick-break-PERF

‘The sneaker is broken and worn (from kicking).’

The same compound \( ti-uo \) demonstrates the application of the unaccusative template in (29). Both \( V_1 \) and \( V_2 \) have a patient-like role to contribute to the argument template and the agent-like role of \( V_1 \) will be suppressed. Thus the alternative unaccusative use of the compound is derived.

One of the cases that is problematic to our earlier generalization was (4c), where a Proto-Patient role seems to occur in the proposed
Proto-Agent position.

(30) $V_1 <\text{agent, theme/causer}> \quad V_2 <\text{theme/cause}>$

\[
\text{<Proto-Agent, \quad Proto-Patient>}
\]

a. lunwen xielao-le ta

=4 thesis write-ole-PERF s/he

‘Thesis wrote her/him old. (lit.)’

This class of VV compounds has one feature in common: the subject of $V_1$ acquires a causer reading and the object a cause reading. At this point, we need to revise the Dowty stipulation that the Proto-Role properties are entailments of the lexical predicates, and adopt Zaenen’s (1991) approach to allow these properties to include lexical potentials. In other words, we regard the thematic structures of each lexical item as underspecified and further specification can bring out a particular sense. In this case, the marked sense of causativization is specified, and as a consequence the theme role of $V_1$ bears the strongest possible Proto-Agent property, causing an event (24c). Once this Proto-Role property is established, the correct prediction follows in our account.

The position that the composite event structure is underspecified is well-motivated. Recall that we assume this semantic marking process occurs before the thematic structure of each predicate is determined. In almost all previous accounts of headed causative constructions, this is done by adjoining the base predicate to an argument position in the event structure of the causative predicate. This is parallel to our position that the semantics of causativization is optionally specified on the participating argument structures before the predicate argument structure of the complex predicate is determined on. Hence, in Mandarin, we predict that the causer property can also be assigned to the agentive role of $V_1$. The only difference is that adding another Proto-Agent property to this role does not affect the outcome of argument selection. Thus a $V_r$ composed with a transitive $V_1$ is ambiguous between the causative and non-causative meanings when the agentlike role of $V_1$ is selected as the Proto-Agent, while it has the unambiguously causative reading when the
patientlike role of \( V_1 \) is selected. This prediction is borne out with the following famous pair.\(^7\)

\[(31)\]

\[\text{a. } \text{ta qilei-le napi ma} \]
\[\text{s/he ride-tire-PERF that-CLASS horse} \]
\[\text{‘S/he makes the horse tired by riding it.’} \]
\[\text{OR ‘S/he rode the horse, and the horse got tired.’} \]
\[\text{b. } \text{neipi ma qilei-le ta} \]
\[\text{that-CLASS horse ride-tire-PERF s/he} \]
\[\text{‘(That horse has certain quality such that) Riding the horse makes her/him tired,’} \]

Last, we will show how our account of the idiosyncratic cases involving the pair of verbs \textit{sheng} ‘to win’ and \textit{bai} ‘to lose’ follows without further stipulation. (32) shows that corresponding \( V_r \)’s with either of the antonyms turn out to be synonymous. However, in intransitive uses, the two \( V_r \)’s are antonymous again, as in (33).

\[(32)\]

\[\text{a. Zhangsan da-sheng-le Lisi} \]
\[\text{Zhangsan fight/play-win-PERF Lisi} \]
\[\text{b. Zhangsan da-bai-le} \]
\[\text{Zhangsan fight/play-lose-PERF Lisi} \]
\[\text{‘Zhangsan beat Lisi,’} \]

\[(33)\]

\[\text{a. Zhangsan da-sheng-le} \]
\[\text{Zhangsan fight/play-win-PERF} \]
\[\text{‘Zhangsan won.’} \]
\[\text{b. Zhangsan da-bai-le} \]
\[\text{Zhangsan fight/play-lose-PERF} \]
\[\text{‘Zhangsan lost.’} \]

The above data have been observed to claim (e.g. J. Huang 1990) that \textit{da-sheng} and \textit{da-bai} are unergative and unaccusative verbs respectively. However, no explanation has been offered as to why such contrary characteristics can be derived from the seemingly identical formation of complex predicates. This is especially problematic for a structure-based
and headed account like Li’s (1990b). Despite his postulation of \( V_1 \) as the head in \( V_r \) ’s, the unaccusativities in these complex predicates seem to follow the lexical property of \( V_2 \), with \textit{sheng} and \textit{bai} shown to be unergative and unaccusative respectively.\(^8\) On the other hand, postulating \( V_2 \) as the head is equally unsupported by facts. The dilemma disappears in our account.

\[(34)\]

(a) \( V_1 \; <\text{agent, patient}> \; V_2 \; <\text{exp., goal}> \; \text{\textit{da-sheng} ‘fight-win,} \)

\( \mid \)

\( \mid \)

\(<\text{Proto-Agent, Proto-Patient}> \)

(b) \( V_1 \; <\text{agent, patient}> \; V_2 \; <\text{theme}> \; \text{\textit{da-bai} ‘fight-lose}’ \)

\( \mid \)

\( \mid \)

\(<\text{Proto-agent, Proto-patient}> \)

\[(35)\]

(a) \textit{Zhangsan sheng-le} \quad \textit{Lisi}

\text{Zhangsan win-PERF Lisi}

‘Zhangsan beat Lisi.’

(b) \textit{Zhangsan bai-le}

\text{Zhangsan lose-PERF}

‘Zhangsan lost.’

c. \*\textit{Zhangsan bai-le} \textit{Lisi}

We show in (35) that the valency of \textit{sheng} and \textit{bai} are different. Crucially \textit{bai} is intransitive. Based on the base argument structures, the argument selections in (34) are predicated with our theory. We also predict that the Proto-Patient role of (34a) can be suppressed to get the (33a) interpretation and an additional mapping to the unaccusative template will be available to \textit{da-bai} to get the (33b) reading. Our account also predicts that it is the argument structures of \( V_1 \) and \( V_2 \) not their meanings that determine the argument structures of the complex predicates they form. This prediction is best illustrated with \textit{shu} ‘lose’ which forms complex predicates that pattern with \textit{sheng}, but not with the synonymous \textit{bai}.

\[(36)\]

(a) \textit{Zhangsan da-shu-le} \quad \textit{Lisi}

\text{Zhangsan fight / play-lose-PERF Lisi}

‘Zhangsan lost to Lisi.’
Thus we have shown that our theory of argument selection correctly predicts the predicate argument-structures of Mandarin resultative complex predicates including some previously unaccounted for cases. We have also shown that these accounts rely crucially on the proposals that prototypical templates are the targets of argument selection, that arguments are selected One-Per-Argument-Structure, and that Proto-Role properties are the semantic primitives determining argument selection.

VI. Potential Problems and Solutions

In this section, we will turn to facts that seem to pose problems to our account and show that they can be incorporated into our theory without further stipulation. The first instance violates the prediction that $V_2$ contributes to the Proto-Patient role and $V_1$ to the Proto-Agent role. In (37), the sole argument of $V_2$ is fused with the Proto-Agent. However, we observe that this phenomenon is limited to a set of lexicalized idioms. The object of these compounds is actually an idiom chunk governed by $V_1$, and substituting any synonymous NP for the frozen form will result in ungrammaticality. In addition to (37), there is also he-zui-jiu ‘drink-drunk-liquor, be drunk’ etc. These cases need to be listed in the lexicon and do not pose a problem for our account.

(37) a. Zhangsan chi-bao fan  le
     Zhangsan eat-full rice  LE
     ‘Zhangsan is full’

b. Zhangsan chi-bao mian  le
     ‘Zhangsan eat-full pasta’

Another potential problem involves $V_1$’s in which $V$ contributes the Proto-Agent role and $V_2$ contributes the Proto-Patient role, as in (38)
and (39).

(38) a. Lisi wan-ni-le       bangqiu
   Lisi play-bored-PERF baseball
   ‘Lisi is getting bored of playing baseball.’

   b. ‘NI<theme-i, PRED<agent-i, patient>>’

(39) a. Zhangsan zhui-lei-le        Li xiaojie, xianzai zhui
   Zhangsan chase-tired-PERF Li Miss now chase
       Wang xiaojie
   Wang Miss
   ‘Zhangsan got tired of courting Miss Li; he is now
   courting Miss Wang.’

   b. LEI<theme-i, PRED<agent-i, patient>>’

As shown in (38b) and (39b), however, this set of exceptions involve an interpretation where the whole event denoted by V₁ is an argument of the predicate represented by V₂. In short, we will simply treat this as a headed construction dictated by the argument structure of V₂.

Thus, the two seeming counterexamples to our account are shown to belong to different categories. They will need separate lexical specifications but will not affect the predictions of our theory.

Ⅶ. Conclusion: Complex Predicates and Verbal Semantics

In this paper, we showed that the prototypical template-based approach offers a better account of predicates representing composite event structures. It also allows a uniform theory to account for the mapping between thematic structures and argument structures, regardless of whether the predicate is complex or not. We also argue that the two different types of complex predicates should be treated differently, the headed complex predicates can be accounted for based on the lexical specifications of the head. The composite complex predicates will have to be accounted for with an argument selection process with prototypical argument templates as their targets.

One of the important issues not addressed in this paper is the prediction of the classes of V₁ ‘s and V₂ ‘s that are allowed to form Vᵣ.
s, including possible co-occurrence constraints. We will posit a partial answer to the question here as a foundation for future research. Following Goldberg’s (1992) account of English resultative constructions, we suggest that these restrictions are semantic in nature.\(^9\) And following Zaenen’s (1991) work, we also suggest that the restrictions involve the Aktionsart of the lexical predicates. Adopting Goldberg’s characterization that the resultative predicate must start at the end of the action predicate, we posit that \(V_2\) must be telic. In particular, they must have an inchoative reading (i.e., bounded at the beginning). This is demonstrated by that \(ku\) ‘to cry’ is a possible \(V_2\) for resultative complex predicates, while \(kan\) ‘to look’ is not, though both are activity verbs with sentient subject. Thus, we have \(qi-ku\) ‘irritate-cry’, \(da-ku\) ‘beat-cry’, \(ji-ku\) ‘worry-cry’ etc.

\[(40)\]
\begin{align*}
\text{tamen ku-le} \\
\text{they cry-LE} \\
\text{a. ‘They cried.’} \\
\text{b. ‘They are crying/started crying.’}
\end{align*}

\[(41)\]
\begin{align*}
\text{wo kan-le} \\
\text{I see-LE} \\
\text{‘I saw it.’}
\end{align*}

(40) shows that \(ku\) is ambiguous with verbal aspect, while (41) is not. This fact cannot be reduced to either stativity or transitivity. Thus we suggest that the classes of verbs which form resultative complex predicates can be defined by lexical semantic features. This is compatible with our result that argument selection of VV complex predicates is determined by semantic properties. Future research on Mandarin complex predicates will help us better understand the morpho-syntactic-semantic interface of natural languages.

Footnotes

\(^1\) \(V_r\) is a misnomer since it strongly suggests that \(V\) is the head. We will refer to them as the VV compounds or simply the resultative predicates in this article.
Notice that in Li’s theory, it is the prominence within each individual thematic structure, not the universal hierarchy of thematic roles, that determines compound formation.

In a recent paper, Li (1992) improves his account of VR compounds by incorporating the semantic relation of causativization. However, the postulation that a causer-causee relation has to be imposed before filtering of thematic hierarchy calls for further theoretical ramification.

For many English speakers, the activity reading of the verb persuade can be brought out by appending a duration adjunct, like for two hours. With this use, we can claim that the verb is ambiguous between an achievement and an activity reading. However, Mandarin quan, never has the achievement reading and the contrast still exists.

Notice that it is well-established that an event implicitly involving complex predicates can be represented as prototypical transitive verbs, the best known examples being the accomplishment and achievement verbs.

A Priori, we take the accusative, the unaccusative, the unergative, and the ditransitive as prototypical argument structures in any language. Another possible prototypical argument template is the causative template. However, we have shown that the semantics of the resultative compounds are different from the causative construction, and we will show later that some of the causative readings can be derived from the two proposed templates without further stipulation.

Li (1992) also discusses these sentences. An additional reading of (31a) where the speaker gets tired of riding the horse will be discussed in the following section.

Examples included zhan-sheng ‘battle-win’, and many others involving the more colloquial ying ‘to win’ as V₂.

Lin (1990) has done preliminary study of the semantic restrictions on either components of resultative compounds.
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