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 PREDICALTES 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 θ-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 θ-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
      ls-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. [V₁(intr)-V₂(intr)]Vᵣ (intr)

    Lisi ku-lei-le
    Lisi cry-BE+tired-PERF
    'Lisi cried such that s/he is tired.'

  b. [V₁(intr)-V₂(intr)]Vᵣ (tran)

    Lisi ku-shi-le   zhentou
    Lisi cry-BE+wet-PERF pillow
    'Lisi cried such that the pillow is wet.'

(4)   [V₁(tran)-V₂(intr)]Vᵣ (tran)

   a. *Wusong da-si-le   laohu*
     Wusong beat-die-PERF tiger
     'Wusong beat the tiger to death.'
   b. *Lisi wan-ni-le   bangqiu*
     Lisi play-bored-PERF baseball
     'Lisi got bored of playing baseball.'
   c. *lunwen xielao-le   ta*   (from Tan 1990)
     thesis   write-old-PERF   s/he
     'Thesis wrote her/him old.   (lit.)'

(5)   [V₁(intr)-V₂(tran)]Vᵣ (tran)

    Laoshi zou-jin-le   jiaoshi
    teacher walk-enter-PERF classroom
    'The teacher walked into the classroom.'

(6)   [V₁(intr)-V₂(tran)]Vᵣ (tran)

    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.

(8) V_r-subject V_r-object

   a. (cf. 3a) $< V_1$ agent $+ V_2$ theme$>$

   b. (cf. 3b) $< V_1$ agent, V_2 theme$>$

   c. (cf. 4a) $< V_1$ agent, V_2 theme$+ V_1$ patient$>$

   d. (cf. 4b) $< V_1$ agent$+V_2$ theme, V_1 patient$>$

   e. (cf. 4c) $< V_1$ patient, V_1 agent$+V_2$ theme $>$

   f. (cf. 5) $<V_1$ agent$+V_2$ theme, V_2 loc/goal$> >$

   g. (cf. 6) $<V_1$ exp.$+V_2$ exp., V_1 theme$+ V_2$ theme$>$

   h. (cf. 7) $<V_1$ agent, V_2 theme$>$? V_1 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 argu- ment 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:

θ-identification, θ-grid, and head feature percolation. The θ-marking convention according to Theta Criterion in the GB framework would only allow one θ-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 θ-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 θ-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 θ-prominence, but not other well-established head properties, such as Case-assignment. His account also never addresses how the abstract concept of 'θ- 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_r 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 θ-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)   *Baoyu qi-ku-le   Daiyu*
        Baoyu anger-cry-PERF   Daiyu
        'Baoyu angered Daiyu such that Daiyu cried.'

                    <1, 2-1'> 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, 2-1'>

Li's account requires that the θ-prominence of the head (V1) 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 θ-role of V_1, is not represented. Thus V_r does not maintain the θ-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 θ-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 θ-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*.[4]

(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\
    'Zhangsan tried to persuade Lisi to quit smoking.'

As shown above, even though *persuade* and *quan* have identical thematic structures and the identical control relation among their thematic roles, they encode very different event structures. English *persuade* is an achievement verb that entails success of the persuasion. 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 Chicheŵa 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.[5] 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.[6]

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***
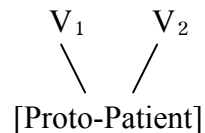   ***The ONE-TO-ONE Mapping Principle***

  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
$$V_1 \qquad V_2$$
$$| \qquad\quad |$$
[Proto-Agent, Proto-Patient]
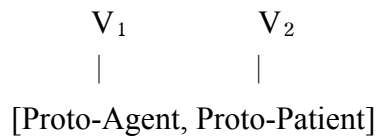
(23)   Mapping to the Unaccusative Template
$$V_1 \quad V_2$$
$$\diagdown \quad \diagup$$
[Proto-Patient]

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) | (\ ) |
              <Proto-agent,   Proto-patient>

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 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) | (/) |
              <Proto - agent,   Proto-patient>

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 npounds with similar argument structures include: *pao-shang* 'runtop', *ie-rul* 'fall-enter, etc.

Next, we will show how our theory accounts for the cases problematic for precious accounts.

(28) V₁ <agent, patient> V₂ <theme>   *ti-puo* 'kick-break'

$$V_1 \ \langle \text{agent, patient}\rangle \ V_2 \ \langle\text{theme}\rangle$$

                 | |

        <Proto-agent,   Proto-patient>

       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 V₁ 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 V₁'s patient. This account enable us to maintain that there is only one transitive verb *ti-puo*, while allowing the optional co-referential reading to be contextually enforced. VV compounds whose coreferential reading is obligatory, such as *chi-guang* 'eat-be+gone', will be lexically specified.

(29) V₁ <agent, patient> V₂ <theme>   *ti-puo* 'kick-break'

              \   /

           <Proto-patient>

  ex. qiu-xue ti-puo-le

     sneaker kick-break-PERF

     'The sneaker is broken and worn (from kicking).'

The same compound *ti-puo* demonstrates the application of the unaccusative template in (29). Both V₁ and V₂ have a patient-like role to contribute to the argument template and the agent-like role of V₁ 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 <agent, theme/causer> V_2 <theme/cause>
                              | |
                  <Proto-Agent,   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_r 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) a. *ta   qilei-le   napi   ma*
        s/he ride-tire-PERF that-CLASS horse
        'S/he makes the horse tired by riding it.'
   OR   'S/he rode the horse, and the horse got tired.'
     b. *neipi   ma   qilei-le   ta*
        that-CLASS horse   ride-tire-PERF s/he
        '(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 *sheng* 'to win' and *bai* 'to lose' follows without further stipulation. (32) shows that corresponding V_r's with either of the <u>antonyms</u> turn out to be <u>synonymous</u>. However, in intransitive uses, the two V_r's are <u>antonymous</u> again, as in (33).

(32) a. *Zhangsan da-sheng-le   Lisi*
        Zhangsan fight/play-win-PERF Lisi
     b. Zhangsan da-bai-le
        Zhangsan fight/play-lose-PERF Lisi
        'Zhangsan beat Lisi.,

(33) a. Zhangsan da-sheng-le
        Zhangsan fight/play-win-PERF
        'Zhangsan won.'
     b. Zhangsan da-bai-le
        Zhangsan fight/play-lose-PERF
        'Zhangsan lost.'

The above data have been observed to claim (e.g. J. Huang 1990) that *da-sheng* and *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 *sheng* and *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 <agent, patient> V_2 <exp., goal> *da-sheng* 'fight-win,
               | |
        <Proto-Agent,   Proto-Patient>
  b. V_1 <agent, patient> V_2 <theme> *da-bai* 'fight-lose'
          | |
        <Proto-agent, Proto-patient>

(35) a. *Zhangsan sheng-le   Lisi*
     Zhangsan win-PERF   Lisi
     'Zhangsan beat Lisi.'
  b. *Zhangsan bai-le*
     Zhangsan lose-PERF
     'Zhangsan lost.'
  c. **Zhangsan bai-le Lisi*

We show in (35) that the valency of *sheng* and *bai* are different. Crucially *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 *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 *shu* 'lose' which forms complex predicates that pattern with *sheng,* but not with the synonymous *bai*.

(36) a. Zhangsan da-shu-le   Lisi
     Zhangsan fight / play-lose-PERF Lisi
     'Zhangsan lost to Lisi.'

b .*Zhangsan da-shu-le*

  Zhangsan fight / play-lose-PERF

  'Zhangsan lost.'

c. *Zhangsan shu-le*

  Zhangsan fight / play-lose-PERF

  'Zhangsan lost.'

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   LE

Another potential problem involves V_r'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 V_1 is an argument of the predicate represented by V_2. In short, we will simply treat this as a headed construction dictated by the argument structure of V_2.

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 V_1's and V_2's that are allowed to form V_r

'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)   *tamen ku-le*
     they   cry-LE
  a. 'They cried.'
  b. 'They are crying/started crying.'

(41)   *wo kan-le*
     I   see-LE
     'I saw it.'

(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.

[2] 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.

[3] 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.

[4] 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.

[5] 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.

[6] *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.

[7] 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.

[8] Examples inclued *zhan-sheng* 'battle-win', and many others involving the more colloquial *ying* 'to win' as V_2 .

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

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