Semantics-oriented resultatives: Evidence from valency alternation verbs

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Abstract

Resultative phrases are generally believed to conform to the Direct Object Restriction: that is, they describe the direct object if verbs are transitive. However, some exceptions have occasionally been reported, and this paper investigates the problem by focusing on resultative phrases that occur with the valency alternation verbs in Japanese and Mandarin Chinese. Verbs that license the locative alternation and locatum-subject alternation describe events that involve two arguments, the location and the locatum, which are perceived to concurrently undergo a change of state. It will be shown that resultative phrases with a valency alternation verb can be predicated of either argument regardless of whether it is expressed as direct object. Furthermore, resultative verbal suffixes in Mandarin, interpreted as description of either the location or the locatum, give rise to the locative alternation while their interpretation remains the same. Thus, it is claimed that in Japanese and Mandarin, the predication relation of resultative phrases is not determined by the grammatical function of arguments as generally believed, but rather by the lexical semantics of the verbs.

1 Introduction

It is generally claimed that resultative phrases in Japanese are similar to those in English in that they obey the Direct Object Restriction, i.e. they are predicated of the direct object of transitive verbs, or the subject of unaccusative intransitive verbs (Simpson, 1983). However, some authors have pointed out examples that do not follow the generalization. (In the following examples, resultative phrases are underlined while the NPs whose referents are described by resultative phrases are in bold.)

(1) otoko-wa **kabe**-ni penki-o aka-ku nut-ta.
man-TOP wall-LOC paint-ACC red-KU smear-PAST
'(lit.) The man smeared paint on the wall (so that it became) red.'
(Nitta, 2002: 52)

The resultative phrase *aka-ku* 'red' describes the oblique NP *kabe* 'wall' rather than the direct object *penki* 'paint,' and the acceptability contrasts with the well-known pair of examples, which shows that the predication relation between resultative phrases and argument NPs is syntactically constrained in English.

(2) a. John loaded **the wagon** full with hay.
b.*John loaded **the hay** into the wagon full.
(Williams, 1980: 204)

Examples in (2) show that resultative phrases in English must be predicated of the direct object while (1) demonstrates that the same syntactic constraint does not apply to Japanese.

Nitta (2002) analyzes the resultative phrase in (1) as an exception and argues that some "verbs of attachment" allow resultative phrases to be predicated of the oblique NP marked with the suffix *-ni* 'on, in, to,' which denotes the goal of attachment. According to him, the exception arises because verbs of attachment describe the events where not only what is attached, but sometimes also what it is attached to can undergo a change of state. While this paper shares his analysis based upon the lexical semantics of verbs, it will show that such resultative phrases are not isolated exceptions, but rather found systematically, and their occurrences are not limited either to the verbs of attachment or to *ni*-marked oblique NPs. In particular, this paper focuses on the verbs of locative alternation. The verb *nur-* 'smear' in (1) and the verb *load* in (2) are locative alternation verbs in Japanese and English respectively. It is claimed that locative alternation verbs allow resultative phrases to be predicated of oblique NPs as well as direct objects.

The phenomenon observed in (1) can also be found in Mandarin Chinese. Cao (2018) argued that resultative verb compounds (V_{action}+V_{result}) can go through the locative alternation in Mandarin and the example is shown in (3).

(3) a. Tailang zai-**baisede-huaping**-li cha-man-le meiguihua
Tailang LOC-white-vase-LOC put-full-PERF rose
'(lit.) Tailang put the roses into the white vase full'

b. Tailang yong-meiguihua cha-man-le **baisede-huaping**
Tailang with-rose put-full-PERF white-vase
'(lit.) Tailang put the white vase full with roses'

(Cao, 2018: 51)

In (3), the V_{result} *man* 'full' describes the resultant state of *baisede-huaping* 'white vase' regardless of whether it is expressed as oblique in (3a) or as a direct object in (3b). Apparently (3b) obeys the Direct Object Restriction but (3a) does not.

This paper claims that resultative phrases are predicated of the argument that undergoes a change of state in the event denoted by the main verb. The locative alternation verbs involve two arguments that undergo a change, and consequently allow either argument to be described by a resultative phrase. Furthermore, the predication relation between resultative phrases and arguments of verbs remain constant regardless of which argument appears as the direct object in the alternative syntactic structures. The analysis is cast in Head-driven Phrase Structure Grammar to encode the lexical semantics of locative alternation verbs. The semantic structure triggers the alternative

syntactic variants while the interpretation of resultative phrases is not anchored to the syntactic realization of arguments, as the Direct Object Restriction predicts, but is analyzed to be tied to the shared semantic representation which identifies two arguments undergoing a change.

2 The resultative construction

Resultative constructions refer to clauses in which, in addition to the main verb (V), there is an additional, secondary predicate known as the result XP, predicating some state that comes about for some participant in the event as a result of the action described by the clause (Beavers, 2016). Some examples in English, Japanese and Mandarin Chinese are given in (4) through (6).

(4) John hammered **the metal** flat.

(5) John-ga **kabe**-o aka-ku nut-ta. (Japanese)
John-NOM wall-ACC red-KU smear-PAST
'John sprayed the wall red.'

(6) Ta ba-**yifu** xi-de ganganjingjing. (Mandarin)
he BA(ACC)-clothes wash-DE clean
'(lit.) He washed the clothes clean.'

The resultant state *flat/aka-ku/ganganjingjing* 'flat/red/clean' in the event are caused by the action expressed by the main verb *hammer/nut-/xi-* 'hammer/smear/wash.' Furthermore, there is another type of resultative construction in Mandarin, which is known as resultative verb compounds, exemplified in (7). A resultative verb compound in Mandarin is, very roughly, a compound verb made up of two parts, the first indicating an action and the second the result of that action (Thompson, 1973). In other words, resultatives are expressed as the second component of the verb compound. Similarly to (6), the resultant state *kai/hong* 'open/red' in (8) and (9) are caused by the action expressed by the main verb *la-/tu-* 'pull/smear.'

(7) La-kai
'pull-open' (V_{action} + V_{result})

(8) Ta la-kai-le **men**.
He pull-open-PERF door
'He pulled the door open.'

(9) John tu-hong-le **qiangmian**.
John smear-(become) red-PERF wall
'John smeared the wall red.'

Regardless of whether a result is expressed by resultative phrases or resultative verb compounds, they are generally believed to conform to the

Direct Object Restriction (the DOR henceforth). The DOR, originally observed by Simpson (1983), and later dubbed by Levin & Rappaport Hovav (1995), states that a resultative phrase in English licensed by a transitive verb is predicated of the postverbal NP, but may not be predicated of a subject or of an oblique complement as shown in (10). Examples (11) and (12) demonstrate that the DOR is equally applicable to Japanese and Mandarin, respectively.

(10)John smeared the **wall** red.

(11)John-ga **kabe**-o akaku nut-ta. (Japanese)
John-NOM wall-ACC red smear-PAST
'John smeared the wall red.'

(12)John tu-hong-le **qiangmian.** (Mandarin)
John smear-(become)red-PERF wall
'John smeared the wall red.'

In the examples above, *red* in English, *akaku* 'red' in Japanese, *hong* 'red' in Mandarin are the resultatives, and they all describe the state of the *wall*, *kabe* 'wall' or *qiagmian* 'wall,' which is the direct object of the verb.

Semantically, Washio (1997), analyzing the Japanese resultative construction, classifies the semantic relations between the main verbs and resultative phrases into "weak" and "strong." "Weak resultatives" describe a result which is predictable from the event denoted by the main verb; resultatives are "strong" if an unpredictable result is described. English and Mandarin allow both strong and weak resultatives, while Japanese only allows weak resultatives according to Washio (1997). Some examples of English and Mandarin are shown below as (13) and (14).

(13)English
a. The horses dragged the **logs** smooth. (Strong)
b. I froze the **ice cream** solid. (Weak)

(14)Mandarin
a. Na-tiao-gou fei-xing-le **wo-baba.** (Strong)
that-CL-dog bark-awake-PREF my-father
'That dog barked my father awake.'
b. John ti-po-le **qiuxie.** (Weak)
John kick-broken-PREF sneaker
'(lit.) John kicked the sneaker broken.'

Thus, while English, Japanese and Mandarin all seem to follow the DOR in basic cases, the semantic property of resultative phrases is more restricted than those in English and Mandarin. In the following sections, however, a closer look at the predication relation of resultative phrases reveals that Japanese and Mandarin are more permissive in that they allow resultative

phrases to be predicated of arguments that are expressed as oblique NPs.

3 Valency alternation verbs in Japanese

This section discusses resultative phrases that appear in the locative alternation construction as well as the locatum-subject alternation construction in Japanese.

3.1 The resultative construction in Japanese

It has been long understood (e.g. Kageyama, 1996) that resultative phrases in Japanese follow the DOR as is the case with English.[1] The previous example (5), repeated here, and (15) show the resultative phrases describing the referent of direct object.

(5) John-ga **kabe**-o aka-ku nut-ta.
John-NOM wall-ACC red-KU smear-PAST
'John sprayed the wall red.'

(15) Taro-ga **kabin**-o konagona-ni[2] kowasi-ta.
Taro-NOM vase-ACC pieces-NI break-PAST
'Taro broke a vase into pieces.'

Since resultative phrases describe a result of a change, it follows that the verbs which allow a resultative phrase generally express an event involving a change of state of the direct object. Some authors further conclude that, unlike English, verbs that appear in the Japanese resultative construction must encode such a change as part of their lexical semantics, distinguishing those verbs as "affected-theme transitives" (Koizumi, 1994), or "change-of-state verbs" (Kageyama, 1996 and 2001). For example, unlike the English counterpart, the Japanese verb of applying force *tatak-* 'hit, beat, pound' does not allow a resultative phrase, e.g. **usu-ku tatak-u* '(lit.) pound thin,' because the state change of the theme argument is not entailed by the verb although it may be likely (Washio, 1997: 9).

Furthermore, the Japanese resultative construction allows only "weak resultatives" (Washio, 1997), or "Type B resultatives" (Iwata, 2006), i.e.

[1]Although this paper deals with transitive verbs, resultative phrases in Japanese also cooccur with unaccusative intransitive verbs describing the referent of subject as characterized by the DOR. Among the Simpson's analyses (1983: 146-147), however, a fake object, e.g. *I laughed myself sick*, or an unsubcategorized object, e.g. *I ate him out of house and home*, are not allowed in Japanese.

[2]Resultative phrases are morphologically marked by the suffix *-ku* as in (5) or *-ni* in (15), depending on their syntactic categories; the difference of those suffixes have no significant consequences for the analysis.

resultative phrases that describe a predictable result. The sentence *The horses dragged the logs smooth* in (13a) has no well-formed Japanese equivalent because, it is claimed, logs' being smooth is not a result predictable from horses' dragging them (Washio, 1997). Thus, the semantic representation of the verbs contains not only a change of state of an argument but also a reference to a specific result.

3.2 Goal-oriented resultatives

Although it is generally claimed that resultative phrases in Japanese also obey the DOR as described in the previous section, some authors (e.g. Nitta, 2002; Miyakoshi, 2006) have pointed out the examples that do not follow the generalization: e.g. in the previous example (1), repeated here, the resultative *aka-ku* 'red' describes the location argument *kabe* 'wall' expressed as an oblique; the resultative *siro-ku* 'white' in (16) describes the oblique *tenzyou-to kabe* 'the ceiling and wall'.

(1) otoko-wa **kabe**-ni penki-o aka-ku nut-ta.
man-TOP wall-LOC paint-ACC red-KU smear-PAST
'(lit.) The man smeared paint on the wall (so that it became) red.'
(Nitta, 2002: 52)

(16) Kyou-wa **tenzyou-to** **kabe**-ni siro-ku penki-o nut-ta.
today-TOP ceiling-and wall-to white-KU paint-ACC spray-PAST
'(lit.) Today, (I) sprayed paint on the ceiling and wall white.'
(Miyakoshi, 2006: 9)

Example (16) is considered to be a deviation in that the resultative is predicated of the oblique locative. Nitta (2002) calls such examples *ni* 'to'-marked NP resultatives and Miyakoshi (2006) goal-oriented resultatives, and both authors attribute the deviation of the predication relation to the event structure of spraying: if paint is sprayed on a wall, the wall necessarily undergo a change of color, thus allowing a resultative phrase to describe the wall.

However, the oblique NPs which resultative phrases are predicated of are not limited to the *ni*-marked NP, and the next section shows that what is crucial for the acceptability of (1) and (16) is not the locative NP but the locative alternation verb *nut-ta* 'smeared, sprayed'.

3.3 Location-oriented resultatives in the locative alternation

Levin (1993: 118) characterizes the locative alternation verbs as describing events of "covering surfaces and putting things into containers," and they exhibit alternative argument structures: for example, English locative alternation verb *load* allows the location argument *the wagon* to be expressed either as direct object *John loaded the wagon with hay*, or an oblique *John*

loaded the hay into the wagon. However, since the DOR predicts that a resultative phrase is predicated of the direct object, the location can be described by a resultative phrase only when it appears as direct object, as confirmed in (2) in Section 1, repeated here.

(2) a. John loaded **the wagon** full with hay.
b.* John loaded the hay into **the wagon** full.

(Williams, 1980: 204)

The resultative phrase *full*, which describes the state of *the wagon*, is acceptable only when *the wagon* is expressed as the direct object.

The verb *nut-ta* 'sprayed' in (16) is a locative alternation verb in Japanese. Unlike the English locative alternation verb *load* in (2), however, the verb allows the location-oriented resultative *siro-ku* 'white' in both alternative syntactic structures.

(17) a. Kyou-wa **tenzyou-to** **kabe**-o siro-ku penki-de nut-ta.
today-TOPceiling-and wall-ACC white-KU paint-with spray-PAST
'Today, (I) sprayed the ceiling and wall white with paint.'

b. Kyou-wa **tenzyou-to** **kabe**-ni siro-ku penki-o nut-ta. (=(16))
today-TOPceiling-and wall-to white-KU paint-ACC spray-PAST
'(lit.) Today, (I) sprayed paint on the ceiling and wall white.'

Locative alternation verbs generally involve two arguments (in addition to the agent if the verb is transitive): the locatum argument that corresponds to what moves, and the location argument that corresponds to the goal of motion: e.g., *penki* 'paint' in (17) is the locatum argument, and *tenzyo-to kabe* 'the ceiling and wall' is the location argument. As many authors argue (e.g. Pinker, 1989), verbs' ability to participate in the locative alternation is lexically constrained: they describe the events where both arguments are perceived to concurrently undergo a change of state or position. The simultaneous changes give rise to alternative syntactic structures that map a distinct argument, i.e. *tenzyo-to kabe* 'the ceiling and wall' in (17a) and *penki* 'paint' in (17b), to the direct object.

This paper claims that resultative phrases in Japanese, as well as those in Mandarin discussed in Section 4, are predicated of the argument that undergoes a change of state in the event denoted by the main verb. That is, the predication relation of resultative phrases is determined by the lexical semantics of verbs, rather than syntactic structures they appear in. Thus, the location-oriented resultative phrase *siroku* 'white' is predicated of the location argument *tenzyo-to kabe* 'the ceiling and wall' regardless of whether the argument appears as the direct object in (17a) or as an oblique in (17b). Furthermore, the next section shows that locative alternation verbs allow not only the location argument but also the locatum argument to be described by a resultative phrase in either syntactic alternative.

3.4 Locatum-oriented resultatives in the locative alternation

The next examples show that a resultative phrase can be predicated of the locatum argument of locative alternation verbs in Japanese, whether it is expressed as direct object or as an oblique. The verb *mai-* 'bind, wind' in (18a) and (18b) is another locative alternation verb in Japanese, although the English counterpart *wind* is not an alternation verb. The locatum argument *houtai* 'bandage' is expressed as direct object in (18a) and described by the resultative phrase *atuku* 'thick,' conforming to the DOR. The resultative phrase can, however, also be predicated of the locatum argument expressed as *de*-marked oblique NP in (18b). The example is taken (and simplified) from the BCCWJ-NT corpus.

(18) a. me-no-ue-ni **houtai-o** atuku mai-ta.
eye-GEN-top-LOC bandage-ACC thick bind- PAST
'(Someone) bound a bandage thick on top of eyes.'

b. me-no-ue-o **houtai-de** atuku mai-ta.
eye-GEN-top-ACC bandage-with thick bind-PAST
'(lit.) (Someone) bound the top of eyes with a bandage thick.'
[Nijo, 2000; simplified]

Although English locative alternation verbs, e.g. *spray,* allow a resultative phrase to be predicated of the locatum argument also, the argument must appear as direct object, as shown in (19).

(19) a. John sprayed **paint** thick on the wall.
b.*John sprayed the wall with **paint** thick.

The Japanese examples in (18) show that the oblique NPs which resultative phrases are predicated of are not limited to *ni*-marked locative NPs, and provide strong evidence that what is crucial for the oblique-oriented resultatives is the locative alternation verbs, which lexically encode multiple arguments that undergo a change of state. Note that, as the examples in (17) and (18) show, there is no syntactic clue as to which argument a resultative phrase is predicated of, and a resultative phrase is interpreted on the semantic basis.

3.5 Resultatives in the locatum-subject alternation: further evidence

The locatum-subject alternation (Levin, 1993: 81) provides further evidence for the semantic nature of constraints on the Japanese resultative construction. Locatum-subject alternation verbs also involve locatum and location arguments, which undergo a change of state. In the alternative syntactic structures, the locatum argument is expressed either as an oblique or the subject: e.g. *water* in *He filled a bottle with water*/*Water filled a bottle*. Levin (1993) shows that in English, only *fill*-type verbs, which require the

location argument to appear as direct object, license the locatum subject alternation. In Japanese, however, *mita-su* 'fill' is a locative alternation verb and some locative alternation verbs also appear in the locatum-subject alternation. Consequently, the variant (20b) with the locatum oblique appears both in the locative alternation (20a and 20b) and in the locatum-subject alternation (20b and 20c).

(20) a. Taro-ga bin-ni mizu-o mitas-ita.
Taro-NOM bottle-to water-with fill-PAST
'(lit.) Taro filled water in a bottle.'

b. Taro-ga bin-o mizu-de mitas-ita.
Taro-NOM bottle-ACC water-with fill-PAST
'Taro filled a bottle with water.'

c. mizu-ga bin-o mitas-ita.
water-NOM bottle-ACC fill-PAST
'Water filled a bottle.'

While Sections 3.3 and 3.4 demonstrated resultatives that appear in the locative alternation, the corpus data show that a resultative phrase can be predicated of either argument in the locatum-subject variant (such as 20c) as well. The resultative phrase *ike-no-you-ni* 'pond-like' describes the location argument *kubon-da-tokoro* 'a hollow' in (21). Since the location is expressed as direct object, the predication relation is equally predicted either syntactically or semantically.

(21) sizuku-ga […] **kubon-da** **tokoro**-o ike-no-you-ni mitas-i, ...
drop-NOM subside-PAST place-ACC pond-GEN-appearance-NI fill-and
'(lit.) Big drops (of water) filled a hollow (in the ground) like a pond ...'
[Zola, 2003; simplified]

Unlike the syntactic prediction by the DOR, however, the locatum subject can also be described by a resultative phrase as demonstrated in (22).

(22) **tanihyouga-**ga atu-ku tani-o mitas-i ...
valley.glacier-NOM thick-KU valley-ACC fill-and ...
'(lit.) The valley glacier fills the valley thick ... '
[Takahashi, 2006; simplified]

The resultative phrase *atuk-u* 'thick' describes the spatial configuration of the locatum subject *tani-hyouga* 'valley glacier' that results from its motion.

These examples together with those in the previous sections show that the predication relation of resultative phrases is not constrained by the syntactic realization of arguments but by the lexical semantics of verbs. Generally, a resultative phrase can be predicated of either argument in a single variant, and of the same argument in either syntactic variant.

4 Valency alternation verbs in Mandarin Chinese

This section will introduce the locative alternation in Mandarin first and then analyze the resultative phrases and resultative verb compounds that appear in locative alternation construction. It is shown that Mandarin, as well as Japanese, allows locatum/location-oriented resultatives in alternative syntactic structures of the locative alternation.

4.1 Locative alternation verbs

Mandarin also has locative alternation verbs such as the verb *tu* 'smear' and *pu* 'spread' in examples (23) and (24) respectively:

(23) a. locatum-as-object variant
John zai-qiangmian-shang tu-le youqi.
John LOC-wall-LOC smear-PERF paint
'John smeared the paint on the wall.'

b. location-as-object variant
John yong-youqi tu-le qiangmian.
John with-paint smear-PERF wall
'John smeared the wall with paint.'

(24) a. locatum-as-object variant
John zai-zhuozi-shang pu-le baozhi.
John LOC-wall-LOC spread-PERF newspaper
'John spread the newspaper on the table.'

b. location-as-object variant
John yong-baozhi pu-le zhuozi.
John with-newspaper spread-PERF table
'John spread the table with newspaper.'

Pinker (1989) argues that a necessary criterion for a verb to participate in the locative alternation is that the verb allows the description of either a type of motion of the locatum argument or an end state of the location argument. A sentence like (23a), in which the locatum (*youqi* 'paint') is the direct object of the verb *tu* 'smear,' is called locatum-as-object variant. In locatum-as-object variant, the locatum argument *youqi* 'paint' undergoes a change of location, which is a type of motion. A sentence like (23b), in which the location (*qiangmian* 'wall') is the direct object of the verb *tu* 'smear' is called location-as-object variant. In location-as-object variant, the location argument *qiangmian* 'wall' undergoes a change of state.

4.2 Location-oriented resultatives in the locative alternation

This section will discuss the location-oriented resultatives that appear as

resultative phrases with locative alternation verbs, and those that appear as the second component (V_{result}) of resultative verb compounds in Mandarin.

The verb *bie* 'fasten' is a locative alternation verb as shown in (25). A location-oriented resultative *jinjinde* 'tight' appears in both locatum-as-object and location-as-object variants respectively.

(25) a. Mary zai-**toufa**-shang jinjinde bie-le san-ge-faqia
Mary LOC-hair-LOC tight fasten-PERF three-CL-hairpin
'(lit.) Mary fastened three hair pins on her hair tightly.'

b. Mary yong-san-ge-faqia jinjinde bie-le **toufa**
Mary with- three-CL-hairpin tight fasten-PERF hair
'(lit.) Mary fastened her hair tightly with three hair pins.'

In (25), the resultative phrase *jinjinde* 'tight' describes the resultant state of the location argument *toufa* 'hair,' regardless of whether the location is expressed as oblique in (25a) or as a direct object in (25b).

Cao (2018) argues that verb compounds can also go through the locative alternation in Mandarin. For instance, the verb *pu* 'spread' mentioned in Section 4.1 can form a resultative verb compound if combined with a resultative verbal suffix *man* 'full,' as *pu-man* 'spread-full' in (26), which still can go through the locative alternation. The examples below show that the V_{result} can be predicted of the location argument of alternation verbs regardless of whether the location is expressed as oblique or as a direct object.

(26) Location-oriented resultatives

a. John zai-**zhuozi**-shang pu-man-le baozhi
John LOC-table-LOC spread-full-PERF newspaper
'(lit.) John spread the newspaper on the table full.'

b. John yong-baozhi pu-man-le **zhuozi**
John with-newspaper spread-full-PERF table
'(lit.) John spread the table full with newspaper.'

Specifically, the V_{result} *man* 'full' describes the resultant state of the location argument *zhouzi* 'table' in both variants, whether it is expressed as oblique in (a) or direct object in (b). Apparently, (26b) obeys the DOR but (26a) does not.

The discussion of resultative verb compounds in Mandarin shows that the second component (V_{result}) of resultative verb compounds are actually predicated of the argument that undergoes the change of state in the event denoted by the main verb. In other words, the predication relation of resultatives is determined by the lexical semantics of verbs, rather than the syntactic structures they appear in.

4.3 Locatum-oriented resultatives in the locative alternation

This section will discuss the locatum-oriented resultatives in the locative alternation that appear as a resultative phrase and as the second component of resultative verb compounds.

Examples (27) and (28) show locative alternation verbs *chan* 'wrap' and *gaizhu* 'cover' respectively. In (27a) and (27b), a locatum-oriented resultative *mimi* 'close' appears in both location-object and locatum-object variants.

(27) Locatum-oriented resultatives in the locative alternation

a. yong-**jiaodai** mimi chan-le yibian da-daizi
with-sellotape close wrap-PERF around big-bag
'(lit.) (someone) wrapped the sellotape around the big bag closely.'
[Wobubai, 2017; simplified]

b. zai-da-daizi-shang mimi chan-le yibian **jiaodai**
LOC-big-bag-LOC close wrap-PERF around sellotape
'(lit.) (someone) wrapped the big bag with sellotape closely.'

In (27), the resultative phrase *mimi* 'close' describes the resultant state of the locatum argument *jiaodai* 'sellotape,' regardless of whether the locatum is expressed as oblique in (27a) or as a direct object in (27b).

Likewise, in (28), the resultative phrase *houhoude* 'thick' describes the resultant state of *baozhi* 'newspaper,' regardless of whether the locatum argument is expressed as oblique in (28a) or as a direct object in (28b).

(28) Locatum-oriented resultatives in the locative alternation

a. chuanghu yong-**baozhi** houhoude gaizhu-le
window-TOP with-newspaper thick cover-PERF
'(lit.) (someone) covered the window with newspaper thick.'
[*Sino News*, 2019; simplified]

b. zai-chuanghu-shang houhoude gaizhu-le **baozhi**
LOC-window-LOC thick cover-PERF newspaper
'(lit.) (someone) covered the newspaper thick on the window.'

Similarly to *pu* 'spread' mentioned in (26), locative alternation verb *tu* 'smear' can appear in a resultative verb compound by combining with a resultative verbal suffix *yun* 'even,' as *tu-yun* 'smear-even,' which still can go through the locative alternation as shown below.

(29) Locatum-oriented resultatives

a. John zai-qiangmian-shang tu-yun-le **youqi**.
John LOC-wall-LOC smear-even-PERF paint
'(lit.) John smeared the paint even on the wall.'

b. John yong-**youqi** tu-yun-le qiangmian.
John with-paint smear-even-PERF wall
'(lit.) John smeared the wall with paint even.'

It has been introduced in Section 2 that both resultative phrases and resultative verb compounds are believed to conform to the DOR, and DOR predicts that resultatives are predicated of the direct object. However, in (29) the V_{result} *yun* 'even' (the second component of resultative verb compound *tu-yun*) describes the state of *youqi* 'paint' in both variants instead of describing the direct object *youqi* in locatum-as-object variant and the direct object *qiangmian* 'wall' in location-as-object variant. That is to say, the resultative *yun* 'even' describes the resultant state of *youqi* 'paint,' regardless of whether the locatum is expressed as a direct object in (29a) or as oblique in (29b).

The analysis of resultative phrases and resultative verb compounds in Mandarin aligns with the discussion of Japanese resultatives, and provides evidence for the claim that the predication relation of resultatives is determined by the lexical semantics of verbs, rather than syntactic structures they appear in.

5 Analysis

In order to formally represent the predication relation between resultative phrases and arguments of locative alternation verbs, the lexical semantics of locative alternation verbs is analyzed in the framework of Head-Driven Phrase Structure Grammar (Sag et al., 2003) with semantic representation based on Minimal Recursion Semantics (Copestake et al., 2005). Although the choice of specific framework is not crucial, the feature structure formalism is chosen because it allows the underspecified mapping between lexical semantics and its syntactic realization.

5.1 Semantic approaches to the locative alternation construction

Since the syntactic notion of direct object is closely tied to the semantic notion of THEME/PATIENT, it is not surprising that there have been semantic approaches to the resultative construction which reanalyze the DOR in terms of the thematic roles. In Construction Grammar approach (Goldberg, 1995 and 2006), for example, the argument labeled as PATIENT is interpreted as the logical subject of a resultative phrase, and is mapped to the direct object. In Lexical Conceptual Structure (LCS) approach (e.g., Levin and Rapoport, 1988; Rappaport and Levin, 1988; Pinker 1989; Kageyama, 1996), the notion of thematic roles is represented in terms of argument positions (or variables) of primitive predicates such as CAUSE. Resultative phrases are represented in terms of the primitive predicate BECOME, and its first argument is associated with the direct object.

Although the two approaches differ in details, both associate a distinct semantic representation with each variant of valency alternations, and identify a single argument to stand in the predication relation of resultatives in each valiant. Given the data in the previous sections, both approaches would pose a problem in analyzing the Japanese and Mandarin resultative constructions since resultative phrases are predicated of either location or locatum argument regardless of which variant they appear in.

The crucial assumption underlying the proposed semantic analysis is that, following the view of such authors as Markantonatou and Sadler (1979) based upon Lexical Functional Grammar, and Beavers (2005 and 2010) based upon Head-Driven Phrase Structure Grammar, locative alternation verbs are associated with a single semantic representation which is mapped to alternative syntactic structures, rather than associating each syntactic variant with a distinct semantic representation. The shared lexical semantics of verbs encodes concurrent changes of state and position of two arguments, either of which can be described by resultative phrases regardless of which argument is mapped onto the direct object. Consequently, the interpretation of resultative phrases is not anchored to the syntactic realization of each variant, as the DOR predicts, but is determined based on the shared semantics.

5.2 Representing locative alternation verbs

The feature-value structure in (30) represents the lexical entry for the locative alternation verb *nut-* 'spray' in Japanese that licenses the variant with the locatum object: e.g. *kabe-ni penki-o nut-ta* 'sprayed paint on a wall,' similar to (17b).

(30) *nur-* 'spray'

$$\begin{bmatrix} \text{ARG-ST} < \text{NP}_i, \text{NP}_j, \text{NP}_k > \\ \text{SEM} \begin{bmatrix} \text{INDEX } s_1 \\ \text{RESTR} < \begin{bmatrix} \text{RELN } smear \\ \text{SMEARER } i \\ \text{LOCATION } j \\ \text{LOCATUM } k \\ \text{BECOME} < s_2, s_3 > \\ \text{SIT } s_1 \end{bmatrix}, \begin{bmatrix} \text{RELN } colored \\ \text{INST } j \\ \text{SIT } s_2 \end{bmatrix}, \begin{bmatrix} \text{RELN } spread \\ \text{INST } k \\ \text{SIT } s_3 \end{bmatrix} > \end{bmatrix} \\ \text{SYN} \begin{bmatrix} \text{HEAD } verb \\ \text{VAL} \begin{bmatrix} \text{SPR} < \text{NP}_i\text{-}ga > \\ \text{COMPS} < \text{NP}_j\text{-}ni, \text{NP}_k\text{-}o > \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

As specified in the value of SEM, the verb's main semantic content is a smearing relation among the individuals indexed as *i* for agent (SMEARER), the location *j* (LOCATION), and the locatum *k* (LOCATUM). The BECOME

feature encodes as part of the lexical semantics that two arguments *j* and *k* undergo a state change in situations s_2 and s_3 respectively: *j* becomes *colored* and *k* becomes *spread*.

Syntactically, as specified in the value of COMPS, the locatum *k* is realized as direct object NP*k* marked by *-o*. It is assumed that a separate lexical entry (not shown) for the same verb specifies a value of COMPS in which the location *j* appears as direct object NP*j* marked by -o while the locatum *k* is mapped to oblique complement NP*k-de*. The crucial part of the analysis is that those two lexical entries license alternative syntactic structures in the locative alternation while sharing the same semantic value.

5.3 Resultative lexical rule

A resultative phrase is introduced by the lexical rule in (31), following the idea of Wechsler and Noh (2001). It targets verbs with lexical semantics that includes a non-empty BECOME value, specifying a change of state of arguments, including, but not limited to, valency alternation verbs, and licenses a resultative phrase which describes the result of such a change of arguments.

(31) Resultative lexical rule

$$\left[\begin{array}{l} \text{INPUT} \left[\begin{array}{l} \text{ARG-ST } \boxed{1} \\ \text{SEM} \left[\begin{array}{l} \text{INDEX } s \\ \text{RESTR } \left\langle \left[\begin{array}{l} \text{BECOME} \langle \ldots, s', \ldots \rangle \\ \text{SIT } s \end{array}\right], \ldots, \boxed{2}\left[\begin{array}{l} \text{RELN } \textit{adj-rel} \\ \text{INST } x \\ \text{SIT } s' \end{array}\right], \ldots \right\rangle \end{array}\right] \end{array}\right] \\ \text{OUTPUT} \left[\text{ARG-ST } \boxed{1} + \left\langle \text{XP}\left[\begin{array}{l} \text{SEM } [\text{RESTR} \langle \boxed{2} \rangle \\ \text{SYN } [\text{VAL } [\text{SPR} \langle \text{NP}_x \rangle]] \end{array}\right] \right\rangle\right] \end{array}\right]$$

The OUTPUT of the lexical rule appends a resultative phrase XP to the ARG-ST list. In effect, the resultative phrase will become an additional member of the VAL and be realized syntactically. Its semantic contribution is coindexed with one of the predications in the input RESTR list, and further instantiates it: e.g. the property *colored* in the predication s_2 in (30) is instantiated as *white* if a resultative phrase *siro-ku* 'white' is added by the lexical rule.[3]

Note that if the predication of the resultative phrase is not unifiable with

[3]The audience of the conference correctly pointed out that, while the lexical rule unifies the predication of the resultative phrase with one of the predications of the verb as intended, the general principle that amalgamates predications of all complements, e.g. the Semantic Compositionality Principle in Sag et al. (2003), puts both (identical) predications in the RESTR list. The semantic effect of having two identical members in the RESTR list is not clear to us, and we do not have an immediate solution to obviate the problem.

any of the predications in the RESTR list of an input verb, the lexical rule fails to apply. It is a desirable result since Japanese allows only "weak resultatives," expressing a result that is predictable from the lexical semantics of the verb. In effect, the semantic content of a resultative phrase and the predictable result specified by the verb both contribute to the description of a resultant state of the argument *x*. Mandarin, however, allows "strong resultatives," and a resultative lexical rule need be more permissive to allow addition of a predication not unifiable with any of the predications in the lexical semantics of the verb.

The SEM value in (30) captures the characteristic shared by all valency alternation verbs: the concurrent state changes of the location and the locatum arguments. It in turn satisfies the requirements of verbs that license a resultative phrase in Japanese discussed in Section 3.1: entailing a change of state of an argument, and specifying its predictable result. Furthermore, the lexical rule in (31) targets a situation that appears in the BECOME list, which encodes the state of an argument that undergoes a change of state. When the lexical semantics of verbs involve more than one argument which undergoes a change of state, i.e. when the BECOME list contains more than one situation, as is the case with (30), a resultative phrase can be predicated of only the argument whose property is unifiable with its property: e.g. the property of a resultative phrase *siro-ku* 'white' is assumed to be unifiable with *colored*, but not with *spread* in (30). As discussed in Section 3.4, there is no syntactic clue as to which argument a resultative phrase is predicated of, and a resultative phrase is only interpreted on the basis of semantic plausibility.

6 Conclusion

This paper analyzes the resultative phrases that occur with valency alternation verbs in Japanese and Mandarin Chinese, and shows that, unlike commonly believed, the restrictions on the predicate relation in the resultative construction are basically semantic rather than syntactic: resultative phrases can describe the result of a state change of a participant in the event regardless of whether such a participant is expressed as direct object or not. The data involving valency alternation verbs are used because they denote an event in which both locatum and location arguments are lexically specified to undergo concurrent changes. Resultative phrases are predicated of either argument regardless of which syntactic variant they appear in, providing evidence that their predication relation is constrained not by the grammatical function but the semantic property of arguments.

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