Deriving Argument Structure in Japanese V-V Compounds

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Abstract

In this article I investigate the argument structure of Japanese V-V Compounds. A lexical analysis is presented, which derives the argument structure and the argument linking of the compounds from Semantic Form (SF), a minimal semantic representation. I will argue that two subclasses of V-V compounds should be distinguished by semantic relation: resultative and non-resultative compounds. It will be shown that the difference in semantic relation results in a different formation of Semantic Form and, consequently, in the different argument structures displayed by compounds of the two subclasses. Taking up ideas of Li (1993), I will argue that the coincidence of the result and the head V2 in resultative compounds constitutes a syntax-semantics mismatch, which can account for the restricted argument structures found in the compounds of this subclass. Since non-resultative compounds do not exhibit such a mismatch, the argument structure in compounds of this type is less restricted. In addition to principles which determine the argument hierarchy and the order of predicates in syntax/morphology and in Semantic Form, I assume a minimal head principle (SUBJECT-HEAD CONDITION), which allows to integrate the head parameter into the analysis.

1. Introduction

Compound verbs of the form [V1 V2] are a prominent feature of Japanese. In line with the general right-headedness of Japanese, V2 functions as the morphological head of the compound, to which derivational and inflectional suffixes are added. V2 is attached to the stem of V1, which is extended by the vowel /-i/ in case of consonant-final stems. An example set of such verb-verb compounds (henceforth: VVCs) is given in (1):

(1) a. warai-hazimeru\(^1\) (laugh-begin) ‘begin to laugh’,
    takai-tuzukeru (use-continue) ‘go on using’,
    nui-owaru (sew-finish) ‘finish sewing’,
    kaki-kakeru (write-be about) ‘be about to write’,
    hataraki-nareru (work-get used) ‘get used to working’,
    kaesi-wasureru (give back-forget) ‘forget to give back’

b. ke-otosu (kick-drop) ‘kick down’,
    arai-nagasu (wash-let flow) ‘wash away’,
    yake-sinu (burn-die) ‘burn to death’,
    oyogi-wataru (swim-cross) ‘swim across’,
    odor-mawaru (dance-turn) ‘dance around’,
    hikari-kagayaku (shine-glitter) ‘shine brightly’

In the past, the phenomenon has not attracted much attention (Shibatani 1973, Martin 1975, Tagashira 1978, Jacobsen 1982, Kageyama 1982, 1989, Tagashira & Hoff 1986, Kuno 1987, Li 1993\(^2\)). Recently, however, Japanese VVCs have been analyzed in more detail in Matsumoto’s (1996) LFG-study and in Nishiyama’s (1998) syntactic account.

There is some agreement that two major classes of VVCs should be differentiated. In the first class, exemplified by (1a), the non-head verb (= V1) is a complement of the head verb (= V2). As a result, the interpretation of these compounds is established via the head-complement relation. There is a fixed number of V2s (generally aspectual or psych verbs, cf. Nishiyama 1998) with which virtually any V1 can be combined. The argument structure of the compounds of this class is identical with the argument structure of V1, which transfers all of its arguments to the resulting complex
verb. In the following example, the ditransitive V1 _kaesu_ ‘give back’ is combined with the transitive V2 _wasureru_ ‘forget’ to form the ditransitive compound _kaesi-wasureru_ ‘forget to give back’:

(2) Kazuko ga Hiroyuki ni okane o _kaesi-wasureru_ -ta.
    NOM DAT money ACC give.back-forget-PAST
    ‘Kazuko forgot to give the money back to Hiroyuki.’

Besides this fully productive and transparent class of VVCs is the one exemplified by the compounds in (1b). The compounds of this class are characterized by the absence of a complement-head relationship. As a consequence, the semantic relation between the events denoted by the single verbs has to be inferred somehow. In _yake-sinu_ (burn-die) ‘burn to death’, e.g., there is a causal relation between the events referred to by the two verbs, and in _oyogi-wataru_ (swim-cross) ‘swim across’, V1 contributes an accompanying manner of motion to the action of crossing something.

As a further difference to the compounds of the first class, the argument structure of the compounds in (1b) is not a simple copy of the argument structure of V1. In the majority of cases, the head verb V2 realizes all of its arguments, and only V1 arguments which are identified with V2 arguments can be transferred to the compound. As a consequence, the valency of the compounds is usually identical with the valency of the head verb, and arguments of V1 that are not identified with V2 arguments are blocked. This is shown clearly in the example in (3), where the transitive V1 _utu_ ‘hit’ is combined with the intransitive V2 _agaru_ ‘go up’. Here, the agent argument of _utu_ ‘hit’ cannot even be realized obliquely, whereas its patient argument is identified with the single argument of _agaru_ ‘go up’:

(3) _Sono booru wa sora takaku (*John ni yotte) uti-agat-ta._
    the ball TOP sky high by hit-go.up-PAST
    ‘The ball was hit up high in the sky (*by John).’ (Matsumoto 1996:204)

A transitive V1 can only pass its object argument to the compound independently if it is combined with a path verb as in _moti-aruku_ (take-walk) ‘carry around’ in (4).

(4) _Kodomo ga tyootin o moti-arui-te i-ta._
    children NOM lantern ACC take-walk-CONT-PAST
    ‘The children carried around lanterns.’

Since Japanese has ditransitive verbs (cf. (2)), the restrictedness of possible argument structures in the compounds of the second class is quite remarkable and cannot be explained by a lack of syntactic expressiveness. Structurally, the combination of a transitive V1 and an intransitive V2 should always be allowed to form a transitive compound with one argument shared as in (4) or even a ditransitive verb without any argument sharing.

The aim of this paper is to explore the processes that govern the argument structure formation of the compounds in the second class, which I will refer to as _class II compounds_. Taking up ideas of Matsumoto (1996) and Li (1993), I will argue that the argument structure of these compounds is determined by the interaction of conceptual constraints on complex verbs and structural characteristics like the position of the head. I will formulate my analysis within a minimal lexical framework (_Lexical Decomposition Grammar_, Wunderlich 1997a) utilizing principles that have been developed in the analysis of the resultative construction (Wunderlich 1997a, Kaufmann & Wunderlich 1998).

Before I turn to my analysis, I will first give an overview of the relevant data in the following section.
2. A subclassification of class II compounds

Matsumoto (1996) presents a detailed taxonomy of class II compounds, which is based on the kind of semantic relation between the events contributed by the single verbs, the type of the verbs (transitive, unergative or unaccusative), and the patterns in argument structure formation. The data presented in this section is based on his work, but unlike Matsumoto I distinguish only two subclasses by semantic relation: *resultative* and *non-resultative compounds*. Resultative compounds (a term already used by Li 1990, 93, 95) exhibit a causal relation between the events referred to by the single verbs: the process denoted by V1 causes the state of change contributed by V2. V2 is either an intransitive change of state verb or a lexical causative. If V2 is intransitive, as in *yake-sinu* (burn-die) ‘burn to death’ or *uti-agaru* (hit-go up) ‘be hit up’, the causation and the resulting effect are clearly distributed between V1 and V2, respectively. This type of resultative compound is called *cause compounds* by Matsumoto. If, however, V2 is a lexical causative, as in *hiki-dasu* (pull-put out) ‘pull out’ or *osi-modosu* (push-return) ‘push back’, it already comprises an unspecified causing action and a resulting change of state. V1 only explicates this causing action in compounds of this type (Matsumoto’s *means compounds*). Nevertheless, a clear causal relation can be established between the action denoted by V1 and the change of state, which is a part of the complex event denoted by V2.

In non-resultative compounds like *mai-otiru* (dance-fall) ‘soar down’ or *sagasi-mawaru* (search-move around) ‘look around for’, the events referred to by the two verbs are not causally related, but are instead interpreted to happen simultaneously. In the vast majority of cases, non-resultative compounds refer to complex motion events with V2 being a path verb and V1 specifying an accompanying manner (Matsumoto’s *manner compounds*). There is also a handful of non-resultative compounds like *hikari-kagayaku* (shine-glitter) ‘shine brightly’ or *naki-sakebu* (cry-shout) ‘scream’, where two verbs of similar meaning are compounded with an intensifying effect (Matsumoto’s *pair compounds*).

In the next two sections, the argument structure patterns for resultative and non-resultative compounds will be presented separately since I consider the presence of a causal relation a decisive factor in the formation of the argument structure of VVCs. For the sake of simplicity, I will ignore additional PP complements (source, goal etc.). Usually only the head verb can introduce a PP independently, and V1 cannot realize a PP complement without unifying it with a PP complement of V2. Moreover, arguments will be represented with variables, and will not be characterized by thematic role labels. Due to a lack of clear grammatical asymmetries, Matsumoto distinguishes unergatives and unaccusatives merely semantically by the agentivity of the single arguments of intransitives. In the following, the two types of intransitives will be differentiated by means of the subscript ‘±ag(enteive)’. For transitives the first variable refers to the agent and the second to the patient/theme. Argument identification is indicated by coindexation. As a convention, I use the variable referring to the head verb argument in the argument list of the compound when two arguments are identified. The example compounds are taken from Matsumoto (1996) and Tagashira & Hoff (1986).

2.1 Resultative compounds

In intransitive-intransitive sequences, the single arguments of both verbs are obligatorily identified. The head verb is always unaccusative, whereas V1 can be unergative or unaccusative. In (5a) the pattern is schematized. An example sentence with the compound *yake-sinu* (burn-die) ‘burn to death’ is given in (5b).
\[(5)\] a. \(V_1(x_{i})_{ag} + V_2(y_{i})_{ag} = V_{VC}(y)_{ag}\)
\[b. \text{Kazi de neko ga yake-sin-da}\]
fire in cat NOM burn-die-PAST
‘The cat died in the flames.’

If an intransitive \(V_2\) is combined with a transitive \(V_1\), either the subject or the object argument of \(V_1\) is blocked, and the remaining \(V_1\) argument is identified with the single argument of the head. (6) shows the pattern and an example for the blocking of the subject argument. Unlike passives, the argument cannot be realized obliquely by marking it with \(ni\) yotte ‘by’.

\[(6)\] a. \(V_1(u, v_i) + V_2(x_{i})_{ag} = V_{VC}(x)_{ag}\)
\[b. \text{Suupu ga (*Taroo ni yotte) ni-tumat-ta.}\]
soup NOM Taro by boil(tr.)-be.packed-PAST
‘The soup was boiled down (*by Taro).’

In the transitive-intransitive sequence in (7), the subject arguments of both verbs are identified, and the object argument of \(V_1\) is blocked. However, in the case of \(nomi\)-\(tubureru\) (drink-collapse) ‘drink oneself unconscious’ in (7b), the object argument of \(V_1\) can still be realized obliquely by means of the instrumental postposition \(de\) ‘with’.

\[(7)\] a. \(V_1(u, v) + V_2(x_{i})_{ag} = V_{VC}(x)_{ag}\)
\[b. \text{Kinoo Yumiko ga {*wain o/ wain de} nomi-tubure-ta.}\]
yesterday NOM wine ACC/ wine with drink-collapse-PAST
‘Yesterday Yumiko drank herself unconscious (with wine).’

Finally, in transitive-transitive combinations the subject arguments of both verbs are always identified. There is, however, some variation with respect to the object arguments. In the great majority of cases the object arguments are identified, as shown in (8):

\[(8)\] a. \(V_1(u, v_j) + V_2(x_{i}, y_{j}) = V_{VC}(x, y)\)
\[b. \text{Rikisi ga aite o zimen ni osi-taosi-ta.}\]
sumo wrestler NOM opponent ACC ground to push-topple-PAST
‘The sumo wrestler pushed his opponent to the ground.’

If the objects of the two verbs cannot be identified for semantic reasons, only the object of the head \(V_2\) ‘survives’, whereas the object of \(V_1\) is blocked from structural realization. This pattern, shown in (9a), is exemplified by \(nomi\)-\(tubusu\) (drink-waste) ‘waste by drinking’ in (9b). As in the case of \(nomi\)-\(tubureru\) in (7b), the object argument of \(V_1\) \(nomu\) ‘drink’ can be realized by means of the postposition \(de\) ‘with’: \(sake\) \(de\) ‘with sake’.

\[(9)\] a. \(V_1(u, v) + V_2(x_{i}, y) = V_{VC}(x, y)\)
\[b. \text{Kare wa {zaisan o/ *sake o} subete nomi-tubusi-ta.}\]
he TOP fortune ACC/ sake ACC all drink-waste-PAST
‘He used up (all of his fortune) by drinking (*sake).’ (Matsumoto 1996:216)

2.2. Non-resultative compounds

If two intransitive verbs are combined, the subject arguments are always identified as in resultative compounds. The pattern for intransitive-intransitive sequences is given in (10a). Unlike resultative compounds, non-resultative compounds allow an unergative \(V_2\). According to Matsumoto, the only
sequence excluded from the combination of two intransitives is an unaccusative V2 preceded by an unergative V1. Typical combinations are sequences of a manner of motion verb followed by a path verb as exemplified by *mai-otiru* (dance-fall) ‘soar down’ in (10b).

(10) a. \( V_1(x_i)_{\text{ag}} + V_2(y_i)_{\text{ag}} = VVC(y)_{\text{ag}} \)
   b. *Yuki ga mai-ot-ta.*
      snow NOM dance-fall-PAST
      ‘The snow soared down.’

In contrast to resultative compounds, a transitive V1 can pass its object argument to the compound without argument identification in transitive-intransitive sequences: if a transitive V1 is followed by an unergative path verb, the subject arguments of both verbs are identified and the object of V1 is passed to the complex verb. This pattern is indicated in (11a). (11b) provides an example sentence with the compound *sagasi-mawaru* (search-go around) ‘look around for’.

(11) a. \( V_1(u_i, v) + V_2(x_i)_{\text{ag}} = VVC(x, v) \)
   b. *Watasi wa tegami o nizikan sagasi-mawat-ta.*
      I TOP letter ACC for two hours search-go.around-PAST
      ‘I looked around for the letter for two hours.’

Examples of transitive-transitive compounds are given in (12) and (13). Analogously to resultative compounds, the respective subject and object arguments are identified in the majority of cases. (12) shows the pattern as well as a full sentence with the compound *hakobi-ageru* (transport-raise) ‘transport up’ as an example.

(12) a. \( V_1(u_i, v) + V_2(x_i, y_j) = VVC(x, y) \)
   b. *Rodoosya ga piano o nikai ni hakobi-age-ta.*
      worker NOM piano ACC second floor to transport-raise-PAST
      ‘The workers transported the piano up to the second floor.’

The rare pattern in (13) constitutes a further difference to resultative compounds. As exemplified by *moti-saru* (take-leave) ‘go away with’ in (13b), it is the object of V1 that is inherited by the complex verb if the object arguments cannot be identified: \( V_2 \) *saru* ‘leave’ can specify the location which is left in form of an object NP\(^4\) if realized as a single verb, but if it is preceded by *motu* ‘take’, it is the object of V1 that is passed to the compound.

(13) a. \( V_1(u_i, v) + V_2(x_i, y) = VVC(x, v) \)
   b. *Taroo ga {okane o /*ie o} moti-sat-ta.*
      NOM money ACC /house ACC take-leave-PAST
      ‘Taro went away {with the money/*from home}.’

In the rare unaccusative-transitive compounds, the single argument of V1 is identified with the object argument of V2. This pattern is indicated in (14a) and exemplified in (14b).

(14) a. \( V_1(u_i)_{\text{ag}} + V_2(x, y_i) = VVC(x, y) \)
   b. *Kitakaze ga kareha o mai-age-ta.*
      north wind NOM dry leaves ACC dance-raise-PAST
      ‘The north wind whirled up the dry leaves.’

The patterns in the argument structure formation of resultative and non-resultative compounds can be summarized as follows: in the compounds of both subclasses the combination of two intransi-
tives always displays obligatory argument sharing. In transitive-intransitive resultative compounds, the V1 argument which cannot be identified with the sole argument of V2 is blocked, whereas V1 can pass its object argument to the compound independently in non-resultative compounds. In transitive-transitive compounds of both subclasses, the subject and object arguments are identified if semantically adequate. However, the two subclasses show differences in cases where the object arguments cannot be identified: in resultative compounds the object argument of V1 is blocked from structural realization, whereas in non-resultative compounds it is the object argument of V2 that is blocked. Finally, in non-resultative compounds there are some rare instances of intransitive-transitive sequences. Here, the sole argument of V1 is identified with the object argument of V2.

Since the two subclasses are distinguished by the presence of a causal relation, it seems plausible to attribute the contrasts in argument structure formation to this difference in semantic relation. The semantic relation thus plays a central role in my analysis: it determines the order of predicates in Semantic Form, from which the argument structure is derived by general principles. Before presenting my analysis, I will first give a short introduction to the lexical theory I adopt.

3. The theoretical framework

My approach to the argument structure of Japanese VVCs is based on the framework of *Lexical Decomposition Grammar* (LDG, Wunderlich 1997a). LDG is a theory of the interaction between a structured semantic representation of a lexical item and its grammatical properties, particularly of the syntactic projection of arguments usually called argument linking. In LDG two levels of meaning representation are distinguished (cf. the ‘two level semantics’ of Bierwisch 1983): the Semantic Form (SF) contains only that part of meaning which has grammatical effects. SF representations are minimal, decomposed expressions formulated in predicate logic. SF functions as an interface level between syntax and the semantically more articulate Conceptual Structure (CS), which can in principle be infinitely detailed. The SF for the ditransitive verb *osieru* ‘teach’ is given in (15).

(15) Semantic Form (SF) of *osieru* ‘teach’

*osieru*: ACT(x) (s) & BEC(KNOW(y, z)) (s)

Due to the minimality requirement, the causal relation between the teaching action (ACT(x)) and the process of gaining knowledge (BEC(KNOW(y, z))) is not represented as is usually done in semantic representations by the predicate CAUSE; rather it is assumed to be conceptually inferred by the following constraint.

(16) **COHERENCE** (Kaufmann 1995a,b, Kaufmann & Wunderlich 1998)

Subevents encoded by the predicates of a decomposed SF structure must be contemporaneously or causally related to each other.

As an additional consequence of minimality, the subevents (or subsituations) referred to in (16) are not represented in (15) either, but are considered to be inferred at Conceptual Structure on the basis of the aspectual properties of the specific predicates. Only the overall situation, which is the referential argument of the verb, is represented by the variable s.

An important feature of SF is its implicitly hierarchical structure. The first predicate introduces the base concept, while additional conjuncts must further specify that predicate within the interpretation space opened up by it. This is captured by the following principle.

(17) **POSSIBLE VERBS** (Kaufmann 1995a,b, Kaufmann & Wunderlich 1998)

In a decomposed SF representation of a verb, every more deeply embedded predicate must specify the higher predicate or sortal properties activated by the higher predicate.
As a consequence of POSSIBLE VERBS, the order of predicates in the SF of osieru ‘teach’ in (15) is not arbitrary but uniquely determined: the conjunct BEC(KNOW(y, z)) specifies the change from not knowing something to knowing something, which can be seen as a result or effect of some unspecified action represented by ACT(x). Therefore, BEC(KNOW(y, z)) has to follow ACT(x) in the linear order of SF conjuncts. The order of predicates determines a hierarchy, which is made visible for the SF of osieru ‘teach’ in the tree in (18).

(18) Hierarchical SF of osieru ‘teach’

\[
\begin{align*}
\text{ACT}(x) & \quad \& \quad \text{BEC(KNOW(y, z))}
\end{align*}
\]

However, the change denoted by BEC(KNOW(y, z)) can only be conceived of as a further specification of something induced by the higher predicate ACT(x) if y can be interpreted as already involved in the causing action referred to by ACT(x). Consequently, y has to be construed as an implicit argument of the predicate ACT(x), which then could be conceived of as x manipulating y by means of some teaching strategy. Since the implicit or explicit sharing of arguments between the decomposition predicates is required for POSSIBLE VERBS to work, it is formulated as an additional condition on well-formed SFs given in (19).

(19) CONNEXION⁵ (Kaufmann 1995a,b, Kaufmann & Wunderlich 1998)

In a decomposed SF structure each predicate must share at least one argument with another predicate, either explicitly or implicitly.

The SF hierarchy also determines the formation of argument structure, which is called θ-Structure in the model. θ-Structure is a sequence of bound variables formed by progressive λ-abstraction over the arguments in Semantic Form. The order of arguments in θ-Structure is uniquely determined by their degree of embeddedness in Semantic Form: the most deeply embedded argument (the lowest argument) is abstracted over first, followed by the next argument up, and so on. The derivation of θ-Structure from SF is captured by the HIERARCHY PRINCIPLE in (20):

(20) HIERARCHY PRINCIPLE (Bierwisch 1989)

In θ-Structure the hierarchy of arguments in SF is preserved in the inverse order.

As an example, the SF of the 3-place verb osieru ‘teach’, given in (15), is complemented by the θ-Structure in (21).

(21) θ-structure and SF of osieru ‘teach’

\[
\begin{align*}
\text{osieru: } & \lambda z. \lambda y \lambda x \lambda s & [\text{ACT}(x) (s) & \& \text{BEC(KNOW(y, z))} (s)]
\end{align*}
\]

With the exception of the situation argument s, which is bound by tense and mood, all arguments in θ-Structure have to be projected into syntax. In the canonical case, the projection of arguments is determined purely structurally by the hierarchy of arguments in θ-Structure (‘structural linking’). Technically, this can be captured by a matching operation: the hierarchy of arguments in θ-Structure and the specific linking devices of a language (morphological case in Japanese) are encoded by the same bivalent features: [±hr] (there is a/no higher role) and [±lr] (there is a/no lower role). The features of each position in θ-Structure are unified with the features of the most specific compatible linker. The feature specification of Japanese case particles is given in (22). The result of the matching operation for the verb osieru ‘teach’ is shown in (23), where incompatible linkers are
marked by an asterisk and compatible linkers which are ruled out by the presence of a more specific linker are crossed out.

(22) Feature specification of Japanese case particles

- **ni**: [+hr, +lr] (dative)
- **o**: [+hr] (accusative)
- **ga**: [ ] (nominative)

(23) *osieru* ‘teach’: \( \lambda z \ \lambda y \ \lambda x \ \lambda s \ \text{[ACT}(x) (s) \& \text{BEC}(\text{KNOW}(y, z)) (s)] \)

\[ +\text{hr} +\text{hr} -\text{hr} -\text{lr} +\text{lr} +\text{lr} \]

\( \text{ga} \ \text{ga} \ \text{ga} \)

\( \text{o} \ \text{o} +\text{o} \)

\( +\text{ni} +\text{ni} +\text{ni} \)

Since the linking of arguments to syntactic positions follows directly from the hierarchy of arguments in SF, the formation of SF is crucial for the realization of the arguments of a lexical item. To rule out arbitrary decomposed structures, SF is assumed to be severely restricted by the conceptual constraints in (16), (17), and (19). In my analysis, I will investigate how these constraints work in the formation of the SF of Japanese VVCs.

4. Event cohesion and the inference of semantic relation

The two verbs in class II compounds can be represented as predicates of one single situation. This is captured by the generalized SF in (24), where P and Q are predicate variables standing for the SFs contributed by the single verbs:

(24) Generalized Semantic Form of class II compounds: \( \{P \& Q\} \ (s) \)

The view that complex verbs refer to a single situation (or a single event in other terminologies) is reported frequently in works on serial verb constructions (cf. Durie 1997). Sometimes the term *event cohesion* is used to refer to the phenomenon (e.g. by Hale 1991 in his study on Misumalpan verb sequencing constructions). That event cohesion is also a characteristic of VVCs has already been suggested by Matsumoto (1996) and Nishiyama (1998).

As a consequence of event cohesion, the semantic relations holding between the subevents are highly restricted. Matsumoto (1996) has formulated lexicalization constraints that determine the tempo-causal relations possible in complex verbs (DETERMINATIVE CAUSATION CONDITION, COEXTENSIVENESS CONDITION). COHERENCE, the constraint introduced in (16), is - although independently developed - nearly identical to the conditions formulated by Matsumoto: for V1 and V2 to refer to a temporally contingent single situation there are two strategies that can be chosen. The first option is to unify the temporal structures of the single verbs so that a simultaneous interpretation arises. This is the case in non-resultative compounds like *kake-agaru* (run-go up) ‘run up’\(^9\), *sagasi-mawaru* (search-move around) ‘look around for’ or *warai-kyooziru* ‘laugh and enjoy’.

The second option for referring to a temporally contingent single situation is to establish a causal relation. This is available if the second verb specifies a transition and the first verb refers to an action affecting an argument as, e.g., in resultative compounds like *yake-sinu* (burn-die) ‘burn to death’, *hiki-dasu* (pull-put out) ‘pull out’ or *tataki-kowasu* (hit-destroy) ‘smash’. The causal relation does not exclude a unification of temporal structures. This is especially obvious if V2 is a lexical
causative comprising an unspecified action and a change of state. In this case the subevent denoted by V1 and the unspecified action are identified. In resultative compounds only direct causation leading immediately to the change of state is allowed. A compound like *yake-siu* (burn-die) ‘burn to death’, e.g., can only mean something like ‘die in the flames’ but not ‘die in hospital several days after suffering severe burns’. Again, this can be seen as an effect of event cohesion: indirect causation, which can be expressed by analytical causatives formed by adding -(s)ase, does not require the result to immediately follow the causing action. Moreover, the fact that intransitive V2s are restricted to non-agentive verbs in resultative compounds should be related to the requirement of direct causation. As already argued by Matsumoto (1996), the sole participant of the caused event referred to by an intransitive V2 cannot display agent properties since this would give him some kind of control over the caused event not compatible with direct causation. Non-resultative compounds, on the other hand, do not exhibit a causal relation. Therefore, intransitive V2s are not restricted to -ag(entine) verbs in this subclass. The single verbs in non-resultative compounds rather have a strong tendency to match with respect to agentivity: in *odori-mawaru* (dance-turn) ‘dance around’ and *moti-aru* (take-walk) ‘carry around’ two agentive verbs are combined, whereas *mai-otiru* (dance-fall) ‘soar down’ and *tare-sagaru* (dangle-hang) ‘hang down’ are sequences of two non-agentive verbs.\(^\text{10}\) This, again, should be attributed to the semantic relation: it is easier to establish a simultaneous relation between two events if both events are either controlled or uncontrolled.

Since event structure is not assumed to be encoded in SF but rather to be derived at Conceptual Structure, neither the specific semantic relation nor the subevents are explicated in the SF of VVCs. In (25) a sketch of how the SF predicates are mapped onto tempo-causal information in Conceptual Structure is provided for a non-resultative and a resultative compound.

\[(25)\] SF-CS mapping of *sagasi-mawaru* (search-move around) ‘look around for’ and *osi-akeru* (push-open) ‘push open’

   a. *sagasi -mawaru*

      SF predicates: \(\text{SEARCH}(x, y) \& \text{MOVE}_\text{AROUND}(x)\)

      \[\Downarrow\]

      CS interpretation: \(s1\) simultaneous with \(s2\) \(s1=s2\)

   b. *osi -akeru*

      SF predicates: \(\text{PUSH}(x, y) \& \{\text{ACT}(x) \& \text{BEC}(\text{OPEN}(y))\}\)

      \[\Downarrow\]

      CS interpretation: \(s1\) \(s2-1\) causes \(s2-2\)

      \[s1\] causes \(s2-2\) \(s1=s2-1\)

In section 5 and 6, I will show how the specific semantic relation determines the order of predicates in SF and, consequently, the formation of \(\theta\)-Structure. I will begin with the subclass of non-resultative and a resultative compound.

5. Non-resultative compounds

In non-resultative compounds, the events denoted by the single verbs are interpreted as happening simultaneously. The vast majority of non-resultative compounds refers to complex motion events, with the head V2 being a path verb and V1 contributing some accompanying manner. Therefore, I will concentrate on non-resultative compounds referring to complex motion events in the following.
5.1 The formation of Semantic Form

Class II compounds are characterized by the absence of the complement-head relation. As a result, the head verb cannot be represented as a functor which takes the non-head as an argument. In such cases the SF of one of the elements in a complex predicate is extended via the lexical operation *Argument Extension* (ARG, Wunderlich 1997b). ARG adds a position for a predicative argument, in which the SF of another element can be integrated by functional composition. The predicative argument is always introduced in the lowest position in SF because any semantic extension is assumed to contribute a further specification of the extended element. Since the morphological head is considered the base for further specification by additional predicates, the extension of the head is the default. Only if the extension of the head leads to a SF which is not well-formed with respect to POSSIBLE VERBS, the extension of the non-head is available. The complex representations yielded by Argument Extension of the head V2 and the non-head V1 are given in (26a) and (b). P is a predicative argument of type \( <e, t> \) added to the SF of the base (represented by ‘V1(...) (s)’ and ‘V2(...) (s)’, respectively).

\[
\text{(26) ARGUMENT EXTENSION (ARG, Wunderlich 1997b)}
\]

<table>
<thead>
<tr>
<th></th>
<th>a. ARG of the head (default):</th>
<th>b. ARG of the non-head:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>( \ldots \lambda s \ V2(...) (s) \rightarrow \lambda P_{se,ts} \ldots \lambda s \ [V2(...) (s) &amp; P(s)] )</td>
<td>( \ldots \lambda s \ V1(...) (s) \rightarrow \lambda P_{se,ts} \ldots \lambda s \ [V1(...) (s) &amp; P(s)] )</td>
</tr>
</tbody>
</table>

Which of the two options in (26) is chosen in the formation of the SF of non-resultative compounds is determined by the interaction of POSSIBLE VERBS with the sequencing of verbs in syntax: the path verb is the second verb, whereas the verb contributing the manner comes first. The mapping of the single verbs to morphology/syntax is given in (27):

\[
\text{(27) Mapping of morphology/syntax and event structure in non-resultative compounds referring to complex motion events}
\]

<table>
<thead>
<tr>
<th>syntactic order:</th>
<th>V1</th>
<th>V2</th>
</tr>
</thead>
<tbody>
<tr>
<td>morphological structure:</td>
<td>non-head</td>
<td>head</td>
</tr>
<tr>
<td>aspect of complex motion event explicated:</td>
<td>manner</td>
<td>path</td>
</tr>
</tbody>
</table>

The coincidence of the morphological head and the path verb should be viewed as a reflex of the fact that Japanese is a path language (Wienold 1995), i.e. in referring to a motion event Japanese tends to focus on the path rather than on the manner of motion. Therefore, Japanese has numerous verbs which specify some aspect of the path but is poor in verbs referring to special ways of moving the body. As a consequence of the mapping in (27), the default extension of the head verb always yields a SF with the predicate specifying the path in the highest position. A generalized SF for VVCs referring to motion events is given in (28). ‘V2\text{path’ and ‘V1\text{manner’ are predicate variables standing for the partial SFs contributed by V2 and V1, respectively:}

\[
\text{(28) Generalized Semantic Form of VVCs referring to complex motion events:}
\]

\[\{V2_{\text{path}} \& V1_{\text{manner}}\} (s)\]

The SF in (28) is in line with POSSIBLE VERBS: the predicate in the highest position introduces the concept of motion and some aspect of the path. The predicate contributed by V1 specifies this concept further by explicating an accompanying manner. Since the SF in (28) is achieved by the default
extension of the head, it is preferred over the complex SF yielded by the extension of the non-head due to the second option in (26). This SF, which would exhibit the reverse order of the partial SFs contributed by V1 and V2, would be in line with POSSIBLE VERBS as well. However, it is excluded because of the well-formedness of the SF in (28). As will be seen in the next section, the availability of a representation with the SF of V1 in the lowest position can explain the differences in argument structure formation found in non-resultative compounds.

5.2 The derivation of θ-Structure

The first pattern to be considered is the combination of two intransitives repeated in (29):

(29) a. \( V1(x_i) + V2(y_i) = VVC(y) \)

b. \( Yuki \ ga \ mai-oti-ta. \)
   snow NOM dance-fall-PAST
   ‘The snow soared down.’

ARG of the head otiru ‘fall’ and the SF of V1 mau ‘dance’ are given in (30a) and (b). Functional composition (FC) yields the SF in (30c). Since the subject argument of V1 (= u) is passed to the complex verb in the process of functional composition, the resulting θ-Structure should yield a transitive compound with independent realization of the V1 argument as object and the V2 argument as subject. However, CONNEXION (introduced in (19)) requires at least one argument to be shared. Since both verbs have only one participant argument, it must be shared. The identification of the two structural arguments, which is indicated by coindexation in SF, has the effect that one \( \lambda \)
-abstractor is removed from θ-Structure. Thus we arrive at the SF and the θ-Structure with the correct linking in (30d).

(30) SF and linking of mai-otiru (dance-fall) ‘soar down’

a. ARG of V2: \( otiru \lambda x \lambda s' [FALL(x) (s)] \rightarrow \lambda P \lambda x \lambda s [FALL(x) (s) & P(s)] \)

b. SF of V1: \( mai-: \lambda u \lambda s' [DANCE(u) (s')] \)

c. FC \( \rightarrow \) mai-otiru: \( \lambda u \lambda x \lambda s [FALL(x) (s) & DANCE(u) (s)] \)

d. CONNEXION \( \rightarrow \) mai-otiru: \( \lambda x \lambda s [FALL(x_i) (s) & DANCE(u_i) (s)] \)

- hr
- lr
linking: \( ga \)

The SF of the complex verb in (30c) is in accordance with POSSIBLE VERBS: FALL denotes a motion down a vertical path. DANCE specifies this motion further by adding a special kind of motion. Since both predicates refer to two components of a complex motion event, the reverse order of predicates would not violate POSSIBLE VERBS, either. However, since the extension of the head is the default, the representation in (30c) is chosen.

The next pattern to be considered are transitive-intransitive sequences like sagasi-mawaru (search-go-around) ‘look around for’. The pattern and the example sentence are repeated in (31).

(31) a. \( V1(u, v) + V2(x_i) = VVC(x, v) \)

b. \( Watasi \ wa \ tegami \ o \ nizikan \ sagasi-mawat-ta. \)
   I TOP letter ACC for two hours search-go-around-PAST
   ‘I looked around for the letter for two hours.’
The composition and linking of the compound are given in (32). Due to CONNEXION the single argument of V2 is identified with the subject argument of V1.\(^\text{11}\) Again, the default extension of the head leads to a well-formed SF with respect to POSSIBLE VERBS: the fact of moving around is specified further by some accompanying searching action. Since the SF of V1 is integrated in the lowest position in the SF of the compound, the object argument of V1 (= v) becomes the lowest argument in the θ-Structure of the compound.

(32) Composition and linking of *sagasi-mawaru* (search-go around) ‘look around for’

\begin{itemize}
  \item a. ARG of V2: *mawaru*: \(\lambda x \lambda s \text{[MOVE}_\text{AROUND}(x) (s)]\)
  \rightarrow \(\lambda P \lambda x \lambda s \text{[MOVE}_\text{AROUND}(x) (s) & P(s)]\)
  \item b. SF of V1: *sagasi-*: \(\lambda v \lambda u \lambda s' \text{[SEARCH}(u, v) (s')]\)
  \item c. FC & CONN. \rightarrow *sagasi-mawaru*: \(\lambda v \lambda x \lambda s \text{[MOVE}_\text{AROUND}(x_i) (s) & \text{SEARCH}(u_i, v) (s)]\)
\end{itemize}

Next we proceed to transitive-transitive compounds like *moti-saru* (take-leave) ‘go away with’. The pattern and the example sentence are repeated in (33):

(33) \begin{itemize}
  \item a. \(V1(u_i, v) + V2(x_i, y) = VVC(x, v)\)
  \item b. *Taro ga {okane o /*ie o} moti-sat-ta.*
  NOM money ACC /house ACC take-leave-PAST
  ‘Taro went away {with the money/*from home}.’
\end{itemize}

The composition of *moti-saru* is given in (34). Since it is rather the result state of *motu* ‘take’ which is contained in the meaning of the compound, I have represented the verb only by the predicate HAVE in (34b) and (c). The identification of the subject arguments in the SF of the compound in (34c) results from CONNEXION.

(34) Composition of *moti-saru* (take-leave) ‘go away with’

\begin{itemize}
  \item a. ARG of V2: *saru*: \(\lambda y \lambda x \lambda s \text{[LEAVE}(x, y) (s)]\)
  \rightarrow \(\lambda P \lambda y \lambda x \lambda s \text{[LEAVE}(x, y) (s) & P(s)]\)
  \item b. SF of V1: *moti-*: \(\lambda v \lambda u \lambda s' \text{[HAVE}(u, v) (s')]\)
  \item c. FC & CONNEXION \rightarrow *moti-saru*: \(\lambda v \lambda y \lambda x \lambda s \text{[LEAVE}(x_i, y) (s) & \text{HAVE}(u_i, v) (s)]\)
\end{itemize}

As can be seen in (34c), functional composition and CONNEXION yield a θ-Structure with an independent realization of the two object arguments (v and y). However, the blocking of the V2 object can be explained by a configurational condition on structurally realizable arguments originally developed in the analysis of the resultative construction. This condition, called STRUCTURAL ARGUMENT, is formulated in (35). STRUCTURAL ARGUMENT involves the notion of *L-command*, which is defined in (36).

(35) **STRUCTURAL ARGUMENT** (Wunderlich 1997a)

An argument is structural if it is either the lowest argument or all of its occurrences L-command the lowest argument.

(36) **L-command** (Wunderlich 1997a)

\(\alpha \text{ L-commands } \beta \) iff the node \(\gamma\), which either directly dominates \(\alpha\) or dominates \(\alpha\) via a chain of nodes type-identical with \(\gamma\), also dominates \(\beta\).
L-command is defined for the nodes in SF, which are logical types in a lexical tree. The lexical tree of *moti-saru* is given in (37). All non-terminal nodes are labeled with logical types. The subscript s marks the situation argument.

(37) Lexical tree of *moti-saru* (take-leave) ‘go away with’

As can be seen in the tree in (37), the object argument of V1 is structural because it is in the lowest position in the resulting SF. The object argument of V2, on the other hand, is not structural since it does not L-command the lowest argument. Therefore, y does not qualify as structural and cannot be realized structurally. As a result, the argument cannot figure in the sequence of $\lambda$-bound variables.

For non-structural arguments the condition in (38) applies:

(38) **NON-STRUCTURAL ARGUMENT**

<table>
<thead>
<tr>
<th>An argument that cannot be realized structurally is</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>a) identified with a structural argument <em>(default)</em></td>
<td>--</td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>b) bound existentially</td>
<td></td>
</tr>
</tbody>
</table>

Identification with a structural argument is the default since in this case the argument remains visible. Existential binding only applies as a last resort if identification with a structural argument is not possible for semantic reasons. Due to NON-STRUCTURAL ARGUMENT, y has to be excluded from the sequence of structural arguments in the $\theta$-Structure of *moti-saru* by existential binding because it cannot be identified with one of the structural arguments. In (39) the SF of *moti-saru* is complemented by the $\theta$-Structure, which predicts the correct projection of arguments into syntax.

(39) Representation and linking of *moti-saru* (take-leave) ‘go away with’

```
moti-saru: $\lambda v \lambda x \lambda s \exists y \left[ \text{LEAVE}(x, y) (s) \& \text{HAVE}(u, v) (s) \right]$
```

linking: *o ga*

If we can identify the non-structural object argument of V2 with the object argument of V1, we arrive at the argument structure of transitive-transitive compounds like *hakobi-ageru* (transport-raise) ‘transport up’, repeated in (40):

(40) a. $V1(u_i, v_j) + V2(x_i, y_j) = VVC(x, y)$

b. *Rodoosya ga piano o nikai ni hakobi-age-ta.*

‘The workers transported the piano up to the second floor.’
A problem with this type of transitive-transitive compound is that \textsc{connexion} is already satisfied by the identification of the object arguments due to \textsc{non-structural argument}. Therefore, the identification of the subject arguments cannot be explained by \textsc{connexion}. It should be considered to result from the requirement of temporal coincidence, but I have to leave this question open for further research. The representation and linking of the compound is given in (41):

(41) Representation and linking of \textit{hakobi-ageru} (transport-raise) ‘transport up’

\[
\begin{align*}
\text{hakobi-ageru: } & \lambda v \lambda x \lambda s \left[ \{ \text{ACT}(x_i) & \text{RISE}(y_1) \} (s) & \text{TRANSPORT}(u_i, v_j) (s) \} \right] \\
& +hr -hr \\
& -lr +lr \\
\text{linking: } & o \ ga
\end{align*}
\]

The final pattern found in compounds referring to motion events is the rare sequence of an unaccusative V1 and a transitive V2, repeated in (42):

(42) a. V1(u_i) + V2(x, y_i) = VVC(x, y)

b. \textit{Kitakaze ga kareha o mai-age-ta}.

\textit{north wind NOM dry.leaves ACC dance-raise-PAST}

‘The north wind whirled up the dry leaves.’

In the representation of \textit{mai-ageru} in (43), the sole argument of the unaccusative \textit{mau} ‘dance’ is in the lowest position, and thereby qualifies as the direct object of the compound. The object argument of the head is non-structural, and its identification with the lowest argument is required by \textsc{connexion} as well as by \textsc{non-structural argument}. The configurational relations between the arguments are made visible in the tree in (44).

(43) Representation and linking of \textit{mai-ageru} (dance (intr.)-raise) ‘whirl s.th. up’

\[
\begin{align*}
\text{mai-ageru: } & \lambda u \lambda x \lambda s \left[ \{ \text{ACT}(x) & \text{RISE}(y_i) \} (s) & \text{DANCE}(u_i) (s) \} \right] \\
& +hr -hr \\
& -lr +lr \\
\text{linking: } & o \ ga
\end{align*}
\]

(44) Lexical tree of \textit{mai-ageru} (dance (intr.)-raise) ‘whirl s.th. up’

\[
\begin{array}{c}
\langle e_s, t \rangle \\
\langle e_s, t \rangle \\
\langle e_s, t \rangle & \langle e_s, t \rangle \\
\text{ACT} & \text{RISE} \\
\langle e_s, t \rangle & \langle e_s, t \rangle \\
\langle e_s, t \rangle \\
\text{DANCE}
\end{array}
\]

Up to now my analysis of non-resultative compounds has focused on VVCs denoting complex motion events. At the end of this section, I turn to the handful of compounds in which two verbs of similar meaning are combined (Matsumoto’s \textit{pair compounds}). Since the single verbs are nearly identical in meaning, their linear order in syntax must be considered a mere idiosyncrasy, i.e. we cannot explain why the order of verbs is \textit{hikari-kagayaku} (shine-glitter) ‘shine brightly’ but not \textit{kagayaki-hikaru}. Nevertheless, the argument structure follows straightforwardly. ARG of the head \textit{kagayaku} ‘glitter’ and integration of the SF of V1 yield the complex SF and the linking in (45).
Since both verbs only have a single argument, CONNEXION requires these arguments to be identified.

(45) \textit{hikari-kagayaku} (shine-glitter): $\lambda x \lambda s \left[ \text{GLITTER}(x_i) (s) \& \text{SHINE}(u_i) (s) \right]$

\hspace{1cm} -hr

\hspace{1cm} -lr

\hspace{2cm} linking: \textit{ga}

5.3 Summary

In this chapter I have shown that the default extension of the head V2 yields a SF which is well-formed with respect to POSSIBLE VERBS. As a result, the partial SF contributed by the non-head V1 is in the lower position in the SF of the compound, leading to a $\theta$-Structure which allows the object of a transitive V1 to be realized independently. The resulting $\theta$-Structure was derived by the interaction of several principles: CONNEXION requires argument sharing and was sufficient to derive the $\theta$-Structure in all combinations with at least one intransitive verb. Moreover, in transitive-transitive combinations I have made use of the principles STRUCTURAL ARGUMENT and NON-STRUCTURAL ARGUMENT, which are already well established in the theory. In the next chapter, I proceed to the analysis of resultative compounds. Since such compounds display a different semantic relation, a different formation of SF and, consequently, differences in the resulting $\theta$-Structures are expected.

6. Resultative compounds

Resultative compounds exhibit a causal relation between the events referred to by the single verbs. I will argue that the presence of the causal relation leads to a SF where the predicate contributed by the head V2 is not in the highest position. As a consequence, the resulting $\theta$-Structure is severely restricted.

6.1 The formation of Semantic Form

In resultative compounds, the order of verbs in syntax/morphology is determined iconically. This is a well-known phenomenon in the study of the serial verb construction (cf. Durie 1997) and has already been stated for VVCs as well by Li (1993) and Nishiyama (1998). In (46) I give a simplified version of Li’s original formulation of the principle:

(46) \textbf{TEMPORAL ICONICITY CONDITION (TIC, Li 1993, simplified):}

\begin{center}
\begin{tabular}{l}
\textbf{The linear order of verbs reflects the temporal order of the events they refer to.}
\end{tabular}
\end{center}

As a consequence of the TIC, the mapping of event structure and syntax/morphology given in (47) results.

(47) Mapping of syntax/morphology and event structure in resultative compounds

<table>
<thead>
<tr>
<th>syntactic order:</th>
<th>V1 -</th>
<th>V2</th>
<th>morph. structure:</th>
<th>non-head -</th>
<th>head</th>
</tr>
</thead>
<tbody>
<tr>
<td>event structure:</td>
<td>causation</td>
<td>\begin{equation*} \begin{cases} \text{causative verb: unspecified activity &amp; result} \ \text{unaccusative verb: result} \end{cases} \end{equation*}</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SF. For a compound like yake-sinu (burn-die) ‘die from burning’ ARG yields the following complex SFs:

(48) SF of yake-sinu (burn-die) ‘die from burning’
   a. extension of the head (default) → BEC(DEAD(x)) (s) & BURN(x) (s)
   b. extension of the non-head → BURN(x) (s) & BEC(DEAD(x)) (s)

The hierarchy of predicates, which is implicit in the linear representations in (48a) and (b), can be made visible by means of the trees in (49a) and (b), respectively.

(49) Hierarchical SF of yake-sinu (burn-die) ‘die from burning’
   a. BEC(DEAD(x)) & BURN(x)
   b. BURN(x) & BEC(DEAD(x))

Due to POSSIBLE VERBS, only the SF in (49b) is well-formed: the effect of BURN(x) can be specified further by the result explicated by BEC(DEAD(x)) but not vice versa, i.e. in cause-result representations the result must always be in the lowest position due to POSSIBLE VERBS. Therefore, only the non-default extension of V1 leads to a SF which is well-formed with respect to POSSIBLE VERBS. The generalized SF of resultative compounds is given in (50). ‘V1\text{cause}’ and ‘V2\text{result}’ are predicate variables standing for the partial SFs contributed by V1 and V2, respectively.

(50) Generalized Semantic Form of resultative VVCs: \{V1\text{cause} & V2\text{result}\} (s)

For Li (1993) the mapping of event structure and morphological structure found in Japanese resultative compounds constitutes a mismatch between the morphological head and what he calls the ‘aspectual head’: due to the coincidence of the non-head V1 and the conceptually more prominent causation, V1 qualifies as the aspectual head, whereas the morphological head V2 contributes the conceptually less prominent result. Since the well-formed SF can only be derived by the (non-default) extension of V1, this mismatch is reflected directly in SF: the partial SF contributed by the non-head V1 is in the highest position in SF, where the base concept is introduced, whereas the SF of the head is in the lowest position, reserved for further specification of the base concept. In the following section, I will show how this mismatch and the demotion of the head-SF into the lowest SF-position lead to the rigid patterns in argument structure introduced in 2.1.

6.2 The derivation of \(\theta\)-Structure

If two intransitive verbs are combined, the resulting complex verb is always intransitive with obligatory sharing of the single arguments. The pattern and the example sentence given in section 2.1 are repeated in (51a) and (b).

(51) a. V1(x_i) + V2(y_i) = VVC(y)

b. Kazi de neko ga yake-sin-da
   fire in cat NOM burn-die-PAST
   ‘The cat burnt to death.’

ARG of V1 and the SF of V2 are given in (52a) and (b). Functional composition yields the SF in (52c). Since CONNEXION requires at least one argument to be shared, the single arguments of
the verbs are identified. As a result, the θ-Structure contains only one argument, which is linked to subject.

(52) Composition and linking of yake-sinu (burn-die) ‘burn to death’

a. ARG of V1: yake-: λu λs [BURN(u) (s)] \(\rightarrow\) λP λu λs [BURN(u) (s) & P(s)]

b. SF of V2: sinu: λx λs’ [BEC(DEAD(x)) (s’)]

c. FC & CONNEXION \(\rightarrow\) yake-sinu: λx λs [BURN(u) (s) & BEC(DEAD(x)) (s)]

- hr
- lr

linking: ga

In intransitive-intransitive compounds the identification of arguments and the θ-Structure trivially result from CONNEXION. However, if we proceed to transitive-intransitive sequences like ni-tumaru (boil(tr.)-be packed) ‘be boiled down’, the derivation of θ-Structure becomes more intricate. The pattern and the example sentence given in section 2.1 are repeated in (53a) and (b), respectively.

(53) a. V1(u, vi) + V2(xi) = VVC(x)

b. Suupu ga ni-tumat-ta.

soup NOM boil(tr.)-be.packed-PAST

‘The soup boiled down.’

The composition of ni-tumaru is given in (54). FC and CONNEXION yield the representation in (54c), in which the object argument of V1 is identified with the single argument of V2:

(54) Composition of ni-tumaru (boil-be packed) ‘boil down (intr.)’

a. ARG of V1: ni-: λv λu λs [BOIL(u, v) (s)] \(\rightarrow\) λP λv λu λs [BOIL(u, v) (s) & P(s)]

b. SF of V2: tumaru: λx λs’ [BEC(SHRUNK(x)) (s’)]

c. FC & CONNEXION \(\rightarrow\) ni-tumaru: λx λu λs [BOIL(u, vi) (s) & BEC(SHRUNK(xi)) (s)]

tumaru

Independently of CONNEXION, the identification of arguments in (54c) also results from NON-STRUCTURAL ARGUMENT since v is not structural. This can be seen in the tree in (55) below:

(55) Lexical tree of ni-tumaru (boil-be packed) ‘boil down (intr.)’

```plaintext
u <e,s,t> & <e,s,t><e,s,t> v \(\rightarrow\) BOIL BEC t SHRUNK x
```

What still needs to be explained is why u, the subject argument of the transitive V1 tumaru ‘boil’, cannot be realized. The unavailability of a conceptual explanation for the blocking of this argument becomes evident when we look at corresponding Chinese transitive-intransitive compounds like qi-bing (annoy-get sick) ‘annoy s.o. so much that s/he gets sick’ in (56).
(56) Lisi qi-bing-le Zhangsan.\textsuperscript{12}

\begin{tabular}{ll}
\begin{tabular}{l}
anno\-ny\-get.sick-ASP
\end{tabular} & \\
\end{tabular}

‘Lisi annoyed Zhangsan so much that Zhangsan got sick.’

In contrast to Japanese, the head-initial Chinese compound does not require the subject of V1 to be blocked. Therefore, the blocking of the subject in \textit{ni-tumaru} should rather be attributed to a structural characteristic like the position of the head. To account for the contrast between Chinese and Japanese VVCs, Li (1993) assumes a rigid version of the head principle, which requires the argument structure of the head to be preserved. This principle would be violated in \textit{ni-tumaru} if the subject argument of the intransitive head V2 was demoted to object due to the realization of the V1 subject. In the Chinese example in (56), on the other hand, the transitive V1 \textit{qi} ‘annoy’ is the head. Therefore, the realization of the agent as subject does not violate the head principle. However, universally such a version of the head principle turns out to be too strong: this is shown e.g. by German prefix verbs with \textit{ver-} exemplified in (57).

\begin{itemize}
\item \textit{Er ver-trank sein Vermögen/*Bier.}
\end{itemize}

\begin{itemize}
\item He ver-drank his fortune/beer
\end{itemize}

‘He used up all his fortune by drinking.’

The base verb \textit{trinken} in \textit{vertrinken} should be considered the head of the prefix verb (Stiebels 1996 among others). To satisfy the strong version of the head principle, the argument hierarchy of \textit{trinken} would have to be preserved in the prefix verb, which is contrary to the facts: the object argument of the head (= the liquid drunk) cannot be realized. The same holds for strong resultative constructions like \textit{den Weinkeller leer trinken} ‘drink the wine cellar empty’. The verb \textit{trinken} is the head of the VP, but its object argument is blocked, only the argument introduced by the result adjective \textit{leer} ‘empty’ can be realized as object. I therefore propose a weaker version of the head principle, which only requires that the highest argument of the head verb (= subject) remains the highest argument in the θ-Structure of the complex verb. This constraint, called the SUBJECT-HEAD CONDITION, is formulated in (58).

\begin{table}
\centering
\begin{tabular}{|l|}
\hline
\textbf{SUBJECT-HEAD CONDITION} \\
\hline
The highest argument of the head must be realized as highest argument (= subject) of the complex verb. \\
\hline
\end{tabular}
\end{table}

Since the SUBJECT-HEAD CONDITION would be violated if the highest argument of V1 in \textit{ni-tumaru} was realized structurally, it must be the case that this argument is a non-structural argument in the argument structure of the compound. As it cannot be identified with a structural argument, it must be bound existentially due to NON-STRUCTURAL ARGUMENT. The representation and linking for \textit{ni-tumaru} in (59) reflect all the conditions introduced so far.

\begin{itemize}
\item \textit{ni-tumaru: }\lambda x \lambda s \exists u [\text{BOIL}(u, v_i)(s) \& \text{BEC}(\text{SHRUNK}(x_i))(s)]
\end{itemize}

\begin{itemize}
\item -hr
\end{itemize}

\begin{itemize}
\item -lr
\end{itemize}

\begin{itemize}
\item linking: \textit{ga}
\end{itemize}

The next pattern to be considered are transitive-intransitive sequences with blocking of the object argument of V1 exemplified by \textit{nomi-tubureru} (drink-collapse) ‘drink o.s. unconscious’. The pattern\textsuperscript{13} and the example sentence are repeated in (60a) and (b).
(60) a. \( V_1(u, v) + V_2(x) = V_{VC}(x) \)

    yesterday NOM wine ACC wine with drink-collapse-PAST
    ‘Yesterday Yumiko drank herself unconscious with wine.’

The composition and linking of nomi-tubureru given in (61) follow straightforwardly: as can be seen in the tree in (62), the object argument of V1 nomu ‘drink’ is non-structural. It cannot be identified with a structural argument and is bound existentially. The structural realization of u, the highest argument of V1, is not possible since this would violate the \textsc{subject-head condition}. Due to \textsc{non-structural argument} it is identified with the highest argument of the head:

(61) Composition and linking of nomi-tubureru (drink-collapse) ‘drink o.s. unconscious’

\begin{enumerate}
\item ARG of V1: nomi-: \( \lambda v \lambda u \lambda s \) [\text{DRINK}(u, v) (s)] \( \rightarrow \lambda p \lambda v \lambda u \lambda s \) [\text{DRINK}(u, v) (s) & P(s)]
\item SF of V2: tubureru: \( \lambda x \lambda s' \) [\text{COLLAPSE} (x) (s')]
\end{enumerate}

(62) Lexical tree of nomi-tubureru (drink-collapse) ‘drink o.s. unconscious’

Next we proceed to transitive-transitive compounds like osi-taosu (push-topple) ‘push down’ repeated in (63).

(63) a. \( V_1(u, v) + V_2(x, y) = V_{VC}(x, y) \)

    b. Rikisi ga aite o zimen ni osi-taosi-ta.
    sumo wrestler NOM opponent ACC ground to push-topple-PAST
    ‘The sumo wrestler pushed his opponent to the ground.’

ARG of V1 osu ‘push’ and the representation of V2 taosu ‘topple’ are given in (64a) and (b). FC and the principles introduced so far yield the representation in (64c) with the correct \( \theta \)-Structure: as can be seen in the tree in (65), the object argument of V1 (= v) does not L-command the lowest argument y and, consequently, is not structural. Due to \textsc{non-structural argument} v is identified with y. As with nomi-tubureru in (60), the highest argument u of V1 cannot be realized independently since this would constitute a violation of the \textsc{subject-head condition}. Here again it is possible to identify it with x, the highest argument of the head.

(64) Composition and linking of osi-taosu (push-topple) ‘push down’

\begin{enumerate}
\item ARG of V1: osi-: \( \lambda v \lambda u \lambda s \) [\text{PUSH}(u, v) (s)] \( \rightarrow \lambda p \lambda v \lambda u \lambda s \) [\text{PUSH}(u, v) (s) & P(s)]
\item SF of V2: taosu: \( \lambda y \lambda x \lambda s' \) [{\text{ACT}(x) & \text{FALL}(y)} (s')]
\end{enumerate}
Finally, we have to consider transitive-transitive compounds with blocking of the V1 object like nomi-tubusu (drink-waste) ‘use up by drinking’, repeated in (66).

(66) Kare wa {zaisan o/ sake o} subete nomi-tubusi-ta.
he TOP fortune ACC/ sake ACC all drink-waste-PAST
‘He used up (all of his fortune) by drinking (*sake).’ (Matsumoto 1996:216)

The representation of nomi-tubusu is given in (67). The only difference to the argument structure of osi-taosu above is that the non-structural object argument of V1 nomu ‘drink’ cannot be identified with the object argument of V2. Therefore, it has to be bound existentially.

(67) Representation and linking of nomi-tubusu (drink-waste) ‘use up by drinking’

nomi-tubusu: \( \lambda y \lambda x \lambda s [\text{DRINK}(u_i, v_j) (s) \& \{\text{ACT}(x_i) \& \text{BE}(\text{CONSUMED}(y))\} (s)] \)
+hr -hr
-ir +ir
linking: o ga

7. Conclusion

In this paper I have demonstrated how the argument structure and the linking of Japanese VVCs can be derived in a lexical framework. The formation of argument structure as well as the order of verbs and the semantic relations between the verbs were shown to be controlled by the interaction of structural and conceptual principles governing the construction of complex predicates. In addition to the TEMPORAL ICONICITY CONDITION already utilized by Li (1993) and Nishiyama (1998), I have made use of essential principles of Lexical Decomposition Grammar: COHERENCE restricts the semantic relations between the verbs in order to establish a temporally coherent interpretation of complex predicates: only contemporaneous or causal relations between the subevents are allowed. The fact that it is these relations that are found to hold between the events denoted by the single verbs of VVCs can be considered as further evidence for this constraint. POSSIBLE VERBS has been utilized to restrict the order of conjuncts in Semantic Form, while the sharing of at least one argument resulted from CONNEXION. The derivation of \( \theta \)-Structure was regulated by the HIERARCHY
**Principle and Structural/Non-Structural Argument.** In addition to these principles, which are already well established in the theory, the blocking of the subject argument in transitive-intransitive resultative compounds has motivated the **Subject-Head Condition**, which requires the highest argument of the head to be realized as the subject of the complex verb. The status of this condition needs to be explored further by cross-linguistic research of verbal complexes. If the **Subject-Head Condition** is not found to be as rigid in other head-final languages, the possibility remains to be explored that it is a violable constraint interacting with additional ones in an Optimality-Theory-like account.

Moreover, I have shown that the argument structure of VVCs crucially depends on the composition of SF and the semantic relation holding between the single verbs. In the case of a causal relation, the interaction of the head parameter with the **Temporal Iconicity Condition** always requires the predicate contributed by the morphological head V2 to appear in the lowest position in SF. As a consequence, the θ-Structure of the compound is severely restricted by the **Subject-Head Condition**. In compounds which display only a contemporaneous relation, the default extension of the head and subsequent integration of the SF of the non-head V1 in the lower position lead to a complex SF which is well-formed with respect to **Possible Verbs**. Consequently, the object argument of a transitive V1 can be passed to the compound without identification as in *sagasi-mawaru* (search-go around) ‘look around for’.

Since the differences in the argument structure formation of resultative and non-resultative compounds are attributed to a difference in semantic relation, similar contrasts are expected in other languages as well. Future research will have to show how the interaction of conceptual and structural factors determines the argument structure of complex verbs.

**Notes**

1. Following the convention, I will use the present tense form (stem-(r)u) as citation form of Japanese verbs. For the sake of simplicity the compounds are not segmented completely into stem1(-i)-stem2-inflectional ending.
2. The relevant Japanese literature is cited in Matsumoto (1996:197). A comprehensive German study is Hasselberg (1996a, b).
3. Kageyama (1989) uses the term *lexical compounds* to refer to compounds of this class as opposed to the members of the first class, which he calls *syntactic compounds*, since he assumes their formation in the syntax. Beside their transparency “syntactic” compounds exhibit several grammatical characteristics (like the possibility of V1 to be passivized or to be substituted/bound by the verbal pro form *soo suru* ‘do so’), which in Kageyama’s view motivates their derivation in syntax via verb incorporation. However, Matsumoto (1996) has shown that not all of Kageyama’s “syntactic” compound verbs behave in the same way with regard to the operations mentioned above, i.e. only some allow V1 to be passivized or substituted by *soo suru* ‘do so’. His analysis demonstrates that these differences should rather be derived from a different degree of independence of the event contributed by V1.
The o-marked argument of *saru* ‘leave’ is the direct object of the verb. It is different in grammatical status from the o-marked traversal phrases that can be added to verbs like *aruku* ‘walk’ or *wataru* ‘cross’. This is shown by the fact that *saru*, but not the verbs cited above can be passivized:

(i) *Kono mura wa minna ni sar-are-ta.*

\[ \text{this village TOP everyone by leave-PASS-PAST} \]

‘This village was left by everyone.’

The only intransitive-transitive resultative compound known to me is the half idiomatic *naki-otosu* (cry-topple) ‘persuade by tears’.

The **shared participant condition**, which was proposed independently by Matsumoto (1996:268), is very similar to **connexion**. The main difference between the two constraints is that **connexion** also allows implicit argument sharing. Therefore, the so-called **strong resultative construction** (Washio 1997) and Chinese VVCs that do not display overt argument sharing do not violate **connexion**. These constructions constitute cases of implicit argument sharing: the entity of which the result is predicated is construed as involved in the causation (cf. Wunderlich 1997a, Kaufmann & Wunderlich 1998).

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These features are a variant of the features originally proposed by Kiparsky (1989).

The bracketing in the representation in (24) is used to emphasize the sharing of the situation argument. ‘\{P & Q\} (s)’ can be rewritten as ‘P(s) & Q(s)’.

For typical manner compounds like *kake-agaru* (run-go up) ‘run up’, which combine a manner of motion with a verb denoting a change in location, it seems to be plausible to causally relate *kakeru* ‘run’ to the change of location expressed by *agaru* ‘go up’. However, as Matsumoto (1996:266) has pointed out, manner of motion verbs like *kakeru* ‘run’ generally cannot be combined with a goal PP, which indicates that they do not denote a change of location.

Non-agentive-agentive compounds like *ukare-aruku* (make merry-walk) ‘gad around’ and *mai-ageru* (dance-raise) ‘whirl up’ mentioned by Matsumoto (1996) are exceptions to this rule.

I assume that argument identification is not allowed to apply arbitrarily, i.e. coindexation of two arguments is only possible if conceptually licensed.

I owe this example to Yi-chun Yang.

The pattern in (60) poses a problem for Nishiyama’s (1998) syntactic account, which is based on Kratzer’s (1996) theory of Voice Phrases. In his analysis, V2 takes a VP headed by V1 as its complement. The external argument is not an argument of one of the verbs but is introduced to the whole verbal complex in the specifier position of a Transitivity Phrase (TrP) if V2 is unergative or transitive. Moreover, a transitive verb can only assign case to its internal argument if it is embedded immediately under a so-called ‘active’ Tr. As a consequence, a transitive V1, which is embedded under V2 but not under Tr, cannot assign case and only allows PRO in its object position. PRO is bound to the next NP c-commanding it. However, for the sentence in (60b) this analysis would yield the structure in (i).
In the structure above the internal argument of V1 nomu 'drink' cannot be case-marked since V1 is not embedded under an active TrP. As a result, V1 only allows PRO, which is coindexed with the internal argument of the unaccusative V2 tubureru 'collapse'. However, such a structure has the wrong interpretation that Hanako collapses because someone is drinking her. The tree above is adequate for transitive-intransitive compounds like ni-tumaru (boil-be packed) 'boil down (intr.)' in (53) but it leads to an absurd interpretation for compounds like nomi-tubureru. Alternatively, Nishiyama could assume the same structure which he proposes for transitive-intransitive compounds like moti-saru (take-leave) 'take away' (saru is classified as unaccusative by Nishiyama). In his analysis of moti-saru, an intermediating TrP introduces an agent to V1 and also allows V1 to case mark its object argument. This would yield the tree with the correct interpretation in (ii). But if this was the adequate structure, we would expect the V1 object to be realizable, which is contrary to the facts.
REFERENCES


