An Event-Based Account of the Unique Path Constraint Effect*

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Abstract: It has often been argued that a change of state expression and a change of location expression cannot co-occur in a single clause. Goldberg (1991) calls this co-occurrence restriction the Unique Path Constraint. This constraint prohibits multiple expressions referring to distinct changes from co-occurring, when these changes occur at the same time. In this paper, I present some empirical problems with Goldberg's account, and propose as an alternative the Single Change per Event Constraint, which prohibits multiple expressions denoting distinct changes from referring to the same event. This constraint comes from the interplay of event structure and the Further Specification Constraint (Tortora 1998), which confirms the validity of the event-based account of human language.

0. Introduction

It has often been noted that a single clause may not include a change of state expression and a change of location expression (cf. Goldberg 1991, 1995, Levin and Rappaport 1995, Tortora 1998, Iwata 2006 among others). For example, observe the following:

(1) a. Sam kicked Bill black and blue.
b. Sam kicked Bill out of the room.

(2) a. * Sam kicked Bill black and blue out of the room.
b. * Sam kicked Bill out of the room black and blue.
(Goldberg 1991:368)

The result phrase *black and blue* in sentence (1a) expresses a resultant state of the referent denoted by the object NP *Bill*. Similarly, the directional phrase *out of the room* in sentence (1b) expresses a resultant location of *Bill*. Interestingly enough, when both the result phrase and the directional phrase co-occur in a single clause, as in (2), the sentence becomes unacceptable.

Based on this observation, Goldberg (1991) proposes the Unique Path Constraint (henceforth, the UPC):

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(3) **The Unique Path Constraint (UPC)**:
If an argument X refers to a physical object, then more than one distinct path cannot be predicated of X within a single clause. The notion of a single path entails two things:
1) X cannot be predicated to move to two distinct locations at any given time *t*.
2) The motion must trace a path within a single landscape.
(Goldberg 1991:368)

The UPC prohibits the co-occurrence of a change-of-state expression and a change of location expression in a single clause when the change-of-state event and the change of location event occur simultaneously. Crucially, the UPC rules out the sentences in (2) in terms of the time relation as to whether the distinct two events occur at the same time. Goldberg (1991) argues that the examples in (2) are unacceptable because the result phrase and directional phrase co-occur in a single clause, and the events denoted by them occur at the same time.

In this paper, I argue that Goldberg's (1991) account faces several empirical problems and that the UPC does not provide an adequate explanation for the co-occurrence restriction on change-of-state expressions and change of location expressions. As an alternative to the UPC, I propose that it is the event relation (whether one event causes the other) not the time relation that is crucially relevant to the co-occurrence restriction. That is, the co-occurrence restriction can be accounted for in terms of event structure. The causal relationship between the event of change-of-state and that of change of location is crucial to their ability to co-occur in a single clause.

I will assume here the notion of event structure proposed by Levin and Rappaport (1995), where a complex event structure is composed of a causing event and a result event. The two events are related to each other in terms of a causal relation. Based on the event relation between a causing event and a result event, I propose the following event structural constraint:

(4) **The Single Change per Event Constraint (SCEC)**:
No more than one distinct cause or result can be involved in the same event.

The Single Change per Event Constraint (hereafter referred to as the SCEC) prohibits the co-occurrence of change of state expressions and change of location expressions when they refer to changes involved in the same event. What crucially differentiates the SCEC from the UPC is that, whereas the latter is based on the time relation (i.e., whether an event of change of location and one of change of state occur simultaneously), the former is relevant to the event relation (i.e., whether there is a causal relation between an event of change of location and one of change of state).

In my account, the sentences in (2) can be ruled out because the result phrase and the directional phrase refer to distinct changes, and both of them are included in the same result event, which violates the SCEC. Thus, this paper validates the event structural account of the co-occurrence restriction on a change of state expression and a change of location expression.

The organization of this paper is as follows. In section 1, I survey the main tenet of the UPC and note several empirical problems. Specifically, I observe that a certain type of direc-

tional phrases may co-occur with result phrases in a single clause even if both of them denote distinct changes that occur simultaneously. Section 2 claims that the directional phrases and result phrases may co-occur in a single clause when they refer to distinct events: a causing event and a result event. Based on this event-based analysis, section 3 gives a theoretical account of the co-occurrence restriction on the change of state expressions and change of location expressions using the decompositional predicate representations proposed by Levin and Rappaport (1995). Finally, in section 4 I provide concluding remarks.

1. Counterarguments to the UPC Account

The UPC account proposed by Goldberg (1991) aims to explain the co-occurrence restriction on change of state expressions and change of location expressions. However, the UPC account, as indicated in the previous section, immediately faces two serious empirical problems, both of which arise because the UPC is formulated on the basis of the time relation as to whether the two distinct events occur at the same time.

First, the examples in (2) are not acceptable even if Bill's becoming black and blue and his leaving the room do not occur at the same time, as shown in (5):

(5) (In the situation where the event of Bill's becoming black and blue and that of his leaving the room do not occur simultaneously.)
   a. * Sam kicked Bill black and blue out of the room.
   b. * Sam kicked Bill out of the room black and blue.

These sentences show that the co-occurrence of the result phrase and the directional phrase makes (5) unacceptable, regardless of whether the two events occurred simultaneously.

Second, the following examples are acceptable under the interpretation where the occurrences of a change of state event and a change of location event are simultaneous:

(6) a. John *squeezed* the rubber ball <u>out of shape</u> <u>into the jar</u>.
   b. John *squashed* the rubber ball <u>out of shape</u> <u>into the jar</u>.

These sentences describe both the motion of the rubber ball, which is denoted by *into the jar*, and its change of state, which is expressed by *out of shape*. The change of state of the rubber ball occurs by its moving into the jar, so the change of state event and the change of location event occur at the same time in these sentences. The UPC would incorrectly predict that these sentences are unacceptable.

To summarize, we have observed two pieces of evidence against the UPC account; the sentences in (2) are not acceptable even if Bill's change of state denoted by the result phrase and his leaving the room expressed by the directional phrase do not co-occur simultaneously, as in (5); and the co-occurrence of the result phrase and the directional phrase is not always impossible even if they occur at the same time, as shown in (6). These two facts strongly suggest that the UPC, which is based on the time relation, is not adequate. We need an alternative account that can adequately explain these facts as well as examples that have been accounted for by the UPC.

In the next section, we observe that a certain type of path phrases may co-occur with

result phrases in a single clause. This type of directional phrase can be considered as a type of instrumental phrase, and therefore, they refer to causes or means.

2. Causal Relations

2.1. Two Types of Directional Phrases

In the literature on the lexical semantics of directional phrases, it is widely observed that directional phrases denote result locations (i.e., result events) (cf. Goldberg 1991, 1995, Levin and Rappaport 1995, 1999, Goldberg and Jackendoff 2004, among others.). For example, Levin and Rappaport (1999:207) state that the directional phrase *out of the room* in (7a) refers to a result location of the participant denoted by the subject NP *Casey*:

(7) a. Casey waltzed out of the room.
b. Casey went out of the room by waltzing.

Sentence (7a) involves a causal relation between the events denoted by the verb *waltz* and the directional phrase *out of the room*: Waltzing enables (causes) *Casey* to go out of the room. This causal relation can be exemplified by the paraphrase in (7b) including a subordinate clause introduced by the preposition *by*, which explicitly shows that the verb *waltz* included in the subordinate clause refers to a cause that leads to the change of location of *Casey*. The directional phrase *out of the room*, in contrast, refers to a result location of *Casey*.

Several researchers, however, note that directional phrases can also function as a type of instrumental phrases (cf. Nilsen 1973, Fillmore 1977, Gawron 1986, Kim 1998, Dixon 2005). Nilsen (1973:84) states that the PPs *onto the floor* and *against the wall* function as instrumental phrases in the following sentences:

(8) a. Hortense smashed the lamp onto the floor.
b. Karl splintered the china against the wall.

These sentences include change of state events denoted by the verbs *smash* and *splinter* and change of location events denoted by the directional phrases. Note that the change of location events in these sentences can be considered to cause the change of state events denoted by the verbs. For example, dropping *the lamp* onto *the floor* in (8a) and hitting *the china* against *the wall* in (8b) can be considered to denote the causes of change of state of these objects. Thus, these directional phrases can be considered to be a type of instrumental phrase. That is, these directional phrases may refer to a cause that leads to the change of state of an object.

This observation can be supported by a paraphrase test using a subordinate clause introduced by the preposition *by*:

(9) a. Hortense smashed the lamp by dropping it onto the floor.
b. Karl splintered the china by hitting it against the wall.

Sentences (9a) and (9b) are paraphrases of sentences (8a) and (8b), respectively. The directional phrases in (9) are included in the subordinate clauses introduced by the preposition *by*, which explicitly suggests that *onto the floor* and *against the wall* refer to the causes of the

changes of state of the objects *the lamp* and *the china*, whereas the verbs *smash* and *splinter* are involved in the main clauses. This arrangement suggests that the change of state of these objects is caused by their change of location.

Given these observations, it follows that there are two types of directional phrases: those that refer to result locations, as in (7), and those that denote causes, as in (8). Thus, the distinction between these two types of directional phrases can be reinterpreted in terms of a causal relation. In the next subsection, based on this dichotomy between the two types of directional phrases, I will argue that the directional phrases in the sentences in (6), which cannot be accounted for by the UPC, refer to the causes of the change of state.

2.2. Causal Relations

At first glance, the sentences in (6) appear to be similar to those in (2), repeated here as (10) and (11), respectively, in that both of them include a result phrase and a directional phrase within a single clause:

(10) a John *squeezed* the rubber ball out of shape into the jar.
b. John *squashed* the rubber ball out of shape into the jar.

(11) a. * Sam kicked Bill black and blue out of the room.
b. * Sam kicked Bill out of the room black and blue.

However, there is a significant difference between the sentences in (10) and (11) in terms of a causal relation between result phrases and directional phrases: The directional phrase in (10) refers to a causing event, whereas that in (11) refers to a result event.

This observation can be confirmed by a paraphrase test using the preposition *by*:

(12) John caused the rubber ball to become out of shape *by* pushing it into the jar.

The sentences in (10) can be paraphrased into sentence (12). In (12), the main clause *John caused the rubber ball to become out of shape* refers to a result event, whereas the subordinate clause *by pushing it into the jar* denotes a causing event. Here, too, the directional phrase *into the jar* is involved in the subordinate clause denoting the causing event, and the result phrase *out of shape* is included in the main clause, which refers to the result event.

The directional phrase in (11), in contrast, denotes a result event, which is illustrated by the following:

(13) a. Sam kicked Bill out of the room.
b. Sam caused Bill to go out of the room by kicking him.

Sentence (13b) is a paraphrase of sentence (13a). This paraphrase shows that the action of kicking is the cause of *Bill*'s change of location. That is, the path phrase *out of the room* in (11) refers to a result event, not a causing event.

In this way, we have observed that the path phrase *into the jar* in (10) refers to a causing event, whereas *out of the room* in (11) denotes a result event. In the next section, us-

ing this event-based distinction between these two types of directional phrases, I will provide a theoretical account of the co-occurrence restriction on change of state expressions and change of location expressions.

3. An Event-Based Account

In the previous sections, we have observed that there are two types of directional phrases: the phrases that are included in a causing event and those that are involved in a result event. This dichotomy between the causing event and the result event can be captured by the decompositional predicate representations assumed by many researchers; I adopt those proposed by Levin and Rappaport (Levin and Rappaport 1995, Rappaport and Levin 1998, 2001, among others). In this section, I provide an account of the co-occurrence restriction on a change of state expression and a change of location expression using the decompositional predicate representations.

3.1. Basic Components of Event Structure

In this subsection, I introduce some basic components of the theoretical framework assumed by Levin and Rappaport (1995) and Rappaport and Levin (1998, 2001). Furthermore, I develop this theoretical framework by incorporating the Further Specification Constraint (Tortora 1998), as discussed below.

Based on the aspectual distinctions proposed by Vendler (1957), Levin and Rappaport develop several event decompositional predicate representations. Events with accomplishment aspect can be considered to be composed of two events. For example, observe the following (Levin and Rappaport 1995:74):

(14) Pam pounded the metal flat.

This sentence describes an event where the metal became flat as a result of Pam's pounding it. Pam's pounding the metal, on the one hand, expresses a causing event of change of state undergone by the metal. The metal's becoming flat, on the other hand, can be regarded as a result event caused by the causing event. This causal relation can be captured by the following decompositional predicate representation:

(15) [*Pam* CAUSE [*the metal* BECOME *flat*] BY [*Pam POUND the metal*]]
(Levin and Rappaport 1995:74, with slight modifications)

In this representation, the result event is designated by *[the metal BECOME flat]*, and the causing event is expressed by *[Pam POUND the metal]*, which is introduced by the function BY.

In this paper, I will express the causal relation between a causing event and a result event in the following simpler way for convenience:

(16) [[$_{\text{CAUSE}}$] CAUSE [$_{\text{RESULT}}$]]
(17) [[$_{\text{CAUSE}}$ Pam pounded the metal] CAUSE [$_{\text{RESULT}}$ the metal became flat]]

The template in (16) is the basic representation of a causal relation between a causing event and a result event: [$_{\text{CAUSE}}$] denotes the causing event, and [$_{\text{RESULT}}$] denotes the result event. In the representation, we can assign the decompositional predicate representation in (17), rather than that in (15), to the sentence in (14).

As a constraint on the maximum complexity of an event structure, Rappaport and Levin (2001:791) assume that a single clause can include two events at most, where the two events are dependent on one another in a causal relation. Thus, the template in (16) can be regarded as the most complex structure, and any complex event structure has to be composed of a causing event and a result event. However, the structure can contain neither two result events nor two causing events.

For this reason, when multiple expressions denoting a result state co-occur in a single clause, they must refer to a single result state, but not distinct result states: this restriction is called the Further Specification Constraint (henceforth, the FSC) (Tortora 1998), as exemplified by the following sentence (Levin and Rappaport 1995:59):

(18) The bottle broke open.

This sentence involves the change of state verb *break* and the result phrase *open*. At first glance, this sentence appears to include two result events. A close scrutiny of this sentence, however, reveals that the result phrase *open* further specifies the meaning of the verb *break*. Thus, this sentence can be considered to include a single unified result state and therefore does not involve two distinct result events. We can assign this sentence the following decompositional predicate representation:

(19) [[$_{\text{CAUSE}}$] CAUSE [$_{\text{RESULT}}$ the bottle became broken open]]

In this representation, the changes of state denoted by the verb *break* and the result phrase *open* are both involved in the same result event, and thus, they refer to a single unified result state.

In this way, the FSC can be adequately incorporated into the event structural account.

3.2. The Single Change per Event Constraint

As an immediate consequence of incorporating the FSC into the decompositional predicate representations, we can postulate that more than one distinct change of state or change of location cannot co-occur in the same causing event or result event. Thus, the constraint in (4), repeated here as (20), naturally follows from the interplay between the nature of the event structure and the FSC:

(20) **The Single Change per Event Constraint (SCEC)**:
No more than one distinct cause or result can be involved in the same event.

What crucially differentiates this constraint from the UPC is that, whereas the UPC is concerned with the time relation (i.e., whether two distinct events occur at the same time), the SCEC is based on the event relation (i.e., whether two distinct events are involved in the

same event).

In the account suggested here, the unacceptability of the sentences in (11), repeated here as (21), can be explained by saying that both of the two distinct events denoted by the result phrase *black and blue* and the directional phrase *out of the room* are involved in the same result event.

(21) a. * Sam kicked Bill black and blue out of the room.
b. * Sam kicked Bill out of the room black and blue.

In section 2.2, we observed that the directional phrase in (21) refers to a result location of *Bill*, and this relationship can be confirmed by the paraphrase in (13), repeated here as (22):

(22) a. Sam kicked Bill out of the room.
b. Sam caused Bill to go out of the room by kicking him.

Sentence (22b), which is a paraphrase of (22a), involves the directional phrase *out of the room* in the main clause, and this arrangement suggests that the directional phrase refers to a result event. The result phrase *black and blue* in (21) can similarly be considered to be involved in a result event, and the following paraphrase illustrates this interpretation:

(23) a. Sam kicked Bill black and blue.
b. Sam made Bill black and blue by kicking him.

Sentence (23a) can be paraphrased with sentence (23b), which includes the result phrase *black and blue* in the main clause, and thus, the result phrase denotes a result state of *Bill*. Note that neither the result phrase nor the directional phrase further specifies the meaning of the other. For this reason, both the directional phrase and the result phrase in (21), which refer to distinct result states, cannot be involved in the same result event.

Note that these sentences are unacceptable even if the change of state and the change of location of *Bill* do not occur at the same time, as we have observed in (5), repeated here as (24):

(24) (In the situation where the event of Bill becoming black and blue
and that of his leaving the room occur simultaneously.)
a. * Sam kicked Bill black and blue out of the room.
b. * Sam kicked Bill out of the room black and blue.

When the two distinct events (Bill's becoming black and blue and leaving the room) do not occur simultaneously, the UPC cannot apply to the sentences in (24) because the UPC prohibits only the simultaneous co-occurrence of multiple distinct changes. That is, the UPC cannot rule out the sentences in (24), whereas the SCEC can. Thus, the unacceptability of the sentences in (21) and (24) can be attributed to the co-occurrence of two distinct results in the same result event. This co-occurrence is exemplified by the following decompositional predicate representation:

(25) [[$_{\text{CAUSE}}$ Sam kicked Bill] CAUSE [$_{\text{RESULT}}$ Bill became black and blue] [$_{\text{RESULT}}$ Bill went out of the room]]

This representation shows that distinct result events (i.e., the event of Bill becoming black and blue and that of Bill leaving the room) co-occur in the same complex event structure. These two result events are independent of one another, and therefore, they cannot be included in the same result event. Thus, the structure in (25) violates the constraint on the maximum complexity of an event structure.

In this subsection, we have observed how the FSC can be incorporated into the event structural account. In the next subsection, based on this theoretical framework, I provide a unified account of the sentences in (10), which licitly include a result phrase and a path phrase in a single clause.

3.3. An Event-Based Account

In section 1.2, we have observed that the UPC is empirically inadequate for explaining the co-occurrence restriction on the change of state expressions and change of location expressions. As an alternative to this constraint, I have proposed the SCEC in section 3.2. In this subsection, I argue that the SCEC can adequately explain the acceptability of the sentences in (10), repeated here as (26), while the UPC cannot satisfactorily do so:

(26) a John *squeezed* the rubber ball out of shape into the jar.
b. John *squashed* the rubber ball out of shape into the jar.

The acceptability of the sentences in (26) can be explained by arguing that the directional phrase *into the jar* refers to a causing event, and the result phrase *out of shape* is involved in a result event; the two distinct changes are not involved in the same event. Thus, these sentences can be represented as follows:

(27) a. [[$_{\text{CAUSE}}$ John squeezed the rubber ball into the jar] CAUSE [$_{\text{RESULT}}$ the rubber ball became out of shape]]
b. [[$_{\text{CAUSE}}$ John squashed the rubber ball into the jar] CAUSE [$_{\text{RESULT}}$ the rubber ball became out of shape]]

As shown by these representations, the two distinct changes (a change of location and a change of state of *the rubber ball*) are properly assigned to distinct events, and thus, these sentences satisfy the SCEC.

In this subsection, I have accounted for the co-occurrence restriction on change of state expressions and change of location expressions based on the event structure. In combination with the FSC, the event structure approach can appropriately rule out the sentences in (21) and (24). The acceptability of the sentences in (26), which are problematic for the UPC, can also be explained by distinguishing two types of directional phrases in terms of their event structural properties.

3.4. Further Considerations

As we have observed thus far, the SCEC is relevant to the event-based relationship between two distinct changes, whereas the UPC is formulated based on the simultaneity of distinct changes. The UPC prohibits the co-occurrence of multiple expressions denoting distinct changes in a single clause, only when these changes occur at the same time. Therefore, the UPC cannot make any reference to cases where there is a time lag between the occurrences of distinct changes. However the SCEC can predict that a change of state expression and a change of location expression may co-occur in a single clause when one change causes the other, even if there is a time lag between the occurrences of these two changes. In this subsection, I show that this prediction is correct and strongly supports the validity of the SCEC.

The following sentences include a result phrase and a directional phrase in a single clause:

(28) a. John broke the vase into pieces against the wall.
b. John broke the vase into pieces onto the floor.

The directional phrases *against the wall* and *onto the floor* in these sentences refer to causes of change of state expressed by the result phrase *into pieces*. In fact, sentences (28a) and (28b) can be paraphrased into sentences (29a) and (29b), respectively:

(29) a. John broke the vase into pieces by hitting it against the wall.
b. John broke the vase into pieces by dropping it onto the floor.

These paraphrases, which include a subordinate clause introduced by the preposition *by*, explicitly show that the result phrase denotes a result event, whereas the directional phrases refer to causing events.

Note that the change of state and the change of location do not co-occur at the same time in the sentences in (28); the change of location of *the vase* is followed by its change of state in these sentences. The UPC cannot make any prediction about the acceptability of these sentences, but the SCEC can. In this way, the sentences in (28) confirm the validity of the SCEC account.

4. Conclusion

In this paper, we have observed that there exists a certain restriction on the co-occurrence of change of state expressions and change of location expressions. The UPC proposed by Goldberg (1991) at first appears to explain this restriction. Goldberg claims that the co-occurrence of these two types of expressions is prohibited when the change of state and the change of location denoted by these expressions occur at the same time. This elaboration implies that the UPC is based on the time relation, i.e., whether the distinct changes occur at the same time. However, we have also observed that, even if directional phrases co-occur with result phrases in a single clause, sentences involving them do not become unacceptable when the directional phrases refer to causes of changes of state denoted by the result phrases. This causal relation is crucially relevant to the co-occurrence restrictions. In this way, I have proposed the SCEC based on the event relation, i.e., whether one event causes the other. This

constraint comes from the interaction between the nature of event structure and the FSC.

What is implicit in this explanation is that the co-occurrence restriction on change of state expressions and change of location expressions must be considered based on a distinction between two types of directional phrases: those that refer to causing events and those that are involved in result events. This categorization means that the event-based distinction between the two types of directional phrases is grammatically relevant. This study is theoretically significant in that I have explicitly shown that the event-based analyses can successfully account for the co-occurrence restriction on the change of state expressions and the change of location expressions.

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