The Syntactic and Semantic Structures of the English Causative *to*-infinitives

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This paper focuses on the Accusative with *to*-infinitive Constructions in English that denote causative meaning, exemplified by *She persuaded me to go to the hospital*. Based on the five diagnostics, the syntactic structures of such constructions are clarified, and on the basis of two semantic perspectives, the semantic structures of the causative verbs occurring therein are defined. Finally, the issue of how the syntactic structures are derived from the semantic structures is addressed by way of the Lexical Conceptual Structures and the Qualia Structures of four types of causative *to*-infinitive verbs.

KEYWORDS: causative *to*-infinitive constructions, causative *to*-infinitive verbs, metonymic clipping, lexical conceptual structure, qualia structure

1. Introduction

In English, there are a large number of sentences containing "V+NP+ (to) +VP" at their predicate positions, as illustrated in (1a-d) (cf. Quirk *et al.* 1985, Mair 1990):

(1) a. You might expect them to rush to La Mama's aid.
    b. I instruct you to pay direct debits from my account at the request of Campaign for Real Ale Limited.
    c. I made them wash and iron and do certain cleaning jobs to earn their spending money.
    d. He saw the pain cross her face.

(BNC)

These have been traditionally called "Accusative with infinitive constructions", since the postverbal NP, being realized as a pronoun, bears an Accusative Case. Such constructions fall into two subtypes, namely, "Accusative with *to*-infinitive constructions," such as (1a) and (1b), and "Accusative with bare infinitive constructions," like (1c) and (1d) (cf. Baron 1974, Duffley 1992).

This paper focuses on the Accusative with *to*-infinitive constructions that denote causative meaning, as in (2a-c):

(2) a. The detectives forced the DA to interrogate the butler.   (Rosenbaum 1967:118)
    b. I persuaded a specialist to examine John.   (Chomsky 1965:22)
    c. I ordered the chauffer to fetch the car.   (Palmer 1974:184)

Each of these sentences expresses an event in which one participant acts on another to do something. In this paper, I will use the term "causative *to*-infinitive constructions" to refer to this type of sentences and "causative *to*-infinitive verbs" to refer to the verbs occurring in such constructions.

The purpose of this paper is to explore the syntactic and semantic properties of the causative *to*-infinitives. In the traditional literature, it has generally been accepted that causative *to*-infinitive verbs take object control complement. Contra this common assumption, I will demonstrate that some of the causative *to*-infinitive verbs, such as *order* and *force*, take ECM complements, by providing two pieces of syntactic evidence. In addition, I will show on the basis of two semantic perspectives that causative *to*-infinitive verbs can be classified into four different semantic types.

The goal of this paper is to elucidate the relationship between the semantic structures and the syntactic structures of the causative *to*-infinitives. In so doing, I will suggest that the structural difference observed in the causative *to*-infinitive constructions should be attributed to the difference in the lexical conceptual structures and the qualia structures of the causative *to*-infinitive verbs occurring therein.

The remainder of this paper is organized in the following way. In section 2, I will investigate the syntactic structures of the causative *to*-infinitive constructions. In section 3, I will explore the semantic properties of the causative *to*-

infinitive verbs, thereby elaborating their lexical conceptual structures. In section 4, building upon the arguments in the previous sections, I will clarify the relationship between syntax and semantics of the causative *to*-infinitives. Section 5 contains a conclusion and consequence.

2.   The Syntactic Structures of the Causative *to*-infinitive Constructions: Object Control or ECM or both?

This section is intended to investigate what type of syntactic structures causative *to*-infinitive verbs should take. Before doing it, I will overview the previous analyses on the syntactic structures of the Accusative with *to*-infinitive constructions as preliminaries to the following sub-sections.

2.1   Three Types of Accusative with *to*-infinitive Constructions: The General Assumption

As we have seen in the previous section, English has plenty of Accusative with *to*-infinitive constructions, as exemplified in (3a-c):

(3)   a.   They persuaded us to sell the house.
       b.   They want us to sell the house.
       c.   They believed us to have sold the house.

(Mair 1990:98–99)

Due to the surface similarities in word order and of the morphosyntactic features, our first impression may be that these examples are identical in structure. However, on closer examination, it has become evident that they are not parallel in structure. Several studies, such as Chomsky (1965), Rosenbaum (1967), and Bresnan (1979), have revealed that Accusative with *to*-infinitive constructions can be divided into three syntactically different groups: *persuade*-type, *want*-type, and *believe*-type. The structures of the three types are considered, respectively, to be as follows:

(4)   a.   *persuade*-type: NP + V + NP_i + [$_{CP}$ [$_{IP}$ PRO_i + to + VP]]
       b.   *want*-type: NP + V + [$_{CP}$ (for) [$_{IP}$ NP + to + VP]]
       c.   *believe*-type: NP + V + [$_{IP}$ NP + to + VP]

(4a) shows that *persuade*-type verbs are triadic verbs, taking two NP arguments and one clausal argument. Furthermore, their indirect object controls PRO[1] in the infinitival clause and thus this type of verbs are referred to as object control verbs. On the other hand, as (4b) and (4c) exhibit, both *want*-type and *believe*-type verbs are dyadic verbs, taking one NP argument and one clausal argument. These two types differ from each other in that the former takes a CP complement but the latter selects an IP complement. The latter *believe*-type verbs are traditionally called ECM verbs (see endnote 5). The structural differences displayed in (4a-c) are highlighted by the following three criteria:

(I)   Passivization of the subject of the infinitival clause
(5)   a.   We were persuaded to sell the house.
       b.   *We are wanted to sell the house.
       c.   We were believed to have sold the house.

(Mair 1990:98–99)

(II)   Synonymity of embedded actives and passives
(6)   a.   I persuaded a specialist to examine John.
    ≠ b.   I persuaded John to be examined by a specialist.

(Chomsky 1965:22)

(7)   a.   I wanted the doctor to examine the boy.
    = b.   I wanted the boy to be examined by the doctor.

(Palmer 1974:181)

(8)   a.   Bernett believed the doctor to have examined Tilman.
    = b.   Bernett believed Tilman to have been examined by the doctor.

(Davies and Dubinsky 2004:3,6)

(III) The possibility of expletive *there* occurring in a postverbal position
(9)   a.   *I had persuaded there to be more chairs in the room.   (Schmerling 1979:301)
       b.   I wanted there to be adequate meals provided.   (Bresnan 1979:151)
       c.   Barnett believed there to be a unicorn in the garden.   (Davies and Dubinsky 2004:8)

The results of the three diagnostics are summarized in Table 1.

Table 1.

| Diagnostics / Types	(I)	(II)	(III)
persuade	OK	not CS[2,3]	*
want	*	CS	OK
believe	OK	CS	OK

In what follows, I will briefly overview the previous accounts for the results of the three diagnostics in turn.

First, let us look at the analysis of the results of the diagnostic (I). Before starting it, it should be necessary to mention the notions of *passivization* and *Empty Category Principle* (ECP) as a prerequisite for the explanation.

In the Government and Binding Theory (see e.g. Chomsky 1981, 1982, Haegeman 1994), a passive sentence is treated as having a D-structure where the object NP occurs in a postverbal position and then moves in a successive cyclic fashion into a matrix subject position to derive an S-structure. For example, the sentence (10) has the D-structure represented in (11) and also has the S-structure shown in (12).

(10)   The suspects were arrested.
(11)   *e* were arrested the suspects
(12)   The suspects were arrested *t*

The D-structure object moves to the empty subject position *e* to derive the S-structure. After moving to the matrix subject position, the element leaves in situ an empty category *t* (= trace). These are schematized in (13) below:

(13)
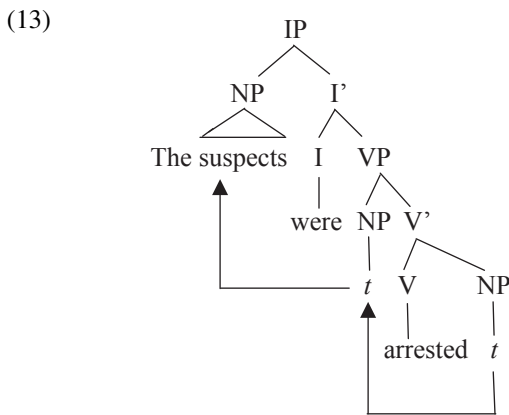
Thus, *the suspects* originates as the complement of *arrested*, and then undergoes passivization, i.e. the movement from the complement of the passive verb to the matrix subject position to form the passive sentence.

Chomsky (1981) proposes that traces are licensed by being governed either by a lexical head or by an antecedent. This is known as the Empty Category Principle (ECP) and is normally stated in terms of the notion of *Proper Government*. ECP and Proper Government are defined in the following way.

(14)   ECP: An empty category must be properly governed.   (cf. Chomsky 1981,1986b)

(15)   Proper Government: α properly governs β if and only if
              (i) α governs β and
              (ii) α is a lexical head or an antecedent

                                                                                                  (ibid)

The formal definition of Government is given below:

(16)   Government: α governs β if and only if
              (i) α is a governor (i.e. Noun, Verb, Adjective, Preposition, and finite INFL)
              (ii) α m-commands β, and
              (iii) there is no γ, γ a barrier for β, such that γ excludes α.   (cf. Chomsky 1986a,b)

Clause (i) of the definition states that only certain elements are eligible to govern. Clauses (ii) and (iii) are expressed in another way, that is, "α and β mutually m-command."
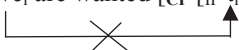
Now that passivization and ECP have been brought out, let us move on to the analysis of the results of the diagnostic (I) by using these two notions. Consider the instances in (5) again.

(17) a. We were persuaded to sell the house.   (=5a)
      b. *We are wanted to sell the house.   (=5b)
      c. We were believed to have sold the house.   (=5c)

Given that (17b) has the *want*-type structure as in (4b), then the S-structure for (17b) is expected to be as follows:

(18) *We$_i$ are wanted [$_{CP}$ [$_{IP}$ t_i to sell the house]]
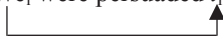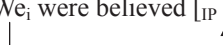
According to the ECP, the antecedent *We* must govern the trace *t* but cannot because there is a barrier CP between the two elements:

(19) *We$_i$ are wanted [$_{CP}$ [$_{IP}$ t$_i$ to sell the house]]

Therefore, this sentence violates the ECP, resulting in an ungrammatical sentence. Conversely, sentences (17a) and (17c) are grammatical for the following reason. Assuming that (17a) has the *persuade*-type structure as in (4a), and (17c) has the *believe*-type structure as in (4c), then the S-structures for the two sentences are, respectively, as follows:

(20) We$_i$ were persuaded t_i [$_{CP}$ [$_{IP}$ PRO to sell the house]]
(21) We$_i$ were believed [$_{IP}$ t_i to have sold the house]

In both (20) and (21), the antecedents *We* can govern the traces as there are no barriers between the two elements:[4]

(22) We$_i$ were persuaded t_i [[PRO to sell the house]]

(23) We$_i$ were believed [$_{IP}$ t_i to have sold the house]

Consequently, these sentences satisfy the ECP and are regarded as grammatical.

Turning now to the results of the diagnostic (II), that is, the synonimity of embedded actives and passives. Consider the examples in question again.

(24)   a. I persuaded a specialist to examine John.   (=6a)
      ≠ b. I persuaded John to be examined by a specialist.   (=6b)
(25)   a. I wanted the doctor to examine the boy.   (=7a)
      = b. I wanted the boy to be examined by the doctor.   (=7b)
(26)   a. Bernett believed the doctor to have examined Tilman.   (=8a)
      = b. Bernett believed Tilman to have been examined by the doctor.   (=8b)

According to (4a-c), (24a), (25a), and (26a) are expected to have the following S-structures, respectively:

(27) a. I persuaded a specialist [PRO to examine John]
      b. I wanted [$_{CP}$ the doctor to examine the boy]
      c. Bernett believed [$_{IP}$ the doctor to have examined Tilman]

Also, the sentences (24b), (25b), and (26b) are expected to have the following S-structures, respectively:

(28) a. I persuaded John [$_{CP}$ PRO to be examined by a specialist]
      b. I wanted [$_{CP}$ the boy to be examined by the doctor]
      c. Bernett believed [$_{IP}$ Tilman to have been examined by the doctor]

It is clear that the state of affairs expressed in (27a) is not the same as that expressed in (28a). More specifically, the person who was persuaded by the subject of the matrix clause in (27a) is different from that in (28a). In the former, it is a *specialist* who was persuaded by the matrix subject, but in the latter, it is *John*. This is why (24a) and (24b) are not cognitively synonymous. By contrast, the infinitival complements in (27b) and (27c) are synonymous with those in (28b) and (28c), respectively. In both (27b) and (28b), what *I* wanted to do is for the doctor to examine the boy. Likewise, in both (27c) and (28c), *Bernett*'s belief is that the doctor examined Tilman.

Finally, let us move on to the analysis of the results of the diagnostic (III). Consider the examples in question again:

(29) a. *I had persuaded there to be more chairs in the room.   (=9a)
       b. I wanted there to be adequate meals provided.   (=9b)
       c. Barnett believed there to be a unicorn in the garden.   (=9c)

To begin with, it is necessary to refer to the properties of *expletetives*. Consider the example in (30):

(30)   There are some people in the classroom.

In such a sentence as (30), the word *there* is called *expletive*, which means a dummy element with no inherent semantic content. The expletive *there* functions as a formal subject and hence cannot occur in a position other than a subject position.
     Given that the sentences in (29) have such structures as (4a-c), then their S-structures are taken to be as follows:

(31) a. *I had persuaded there [PRO to be more chairs in the room]
       b. I wanted [there to be adequate meals provided]
       c. Barnett believed [there to be a unicorn in the garden]

In both (31b) and (31c), the expletive *there* occupies the embedded subject position. On the other hand, in (31a), the expletive *there* does not appear in the subject position of the infinitival complement clause but in the indirect object position of the matrix verb. This is why (29a), unlike (29b) and (29c), is ungrammatical.
     To summarize this section, I have briefly overviewed three types of Accusative with *to*-infinitive constructions: *persuade*-type, *want*-type, and *believe*-type. In terms of the above-mentioned three diagnostics, the internal structures for the three types have been assumed to be (32a-c):

(32) a. *persuade*-type: NP + V + NP$_i$ + [$_{CP}$ [$_{IP}$ PRO$_i$ + to + VP]]   (=4a)
       b. *want*-type: NP + V + [$_{CP}$ (for) [$_{IP}$ NP + to + VP]]   (=4b)
       c. *believe*-type: NP + V + [$_{IP}$ NP + to + VP]   (=4c)

These three types can be broken into two major groups, those taking an infinitival clause as their sole complement and those taking an indirect object in addition to an infinitival clause. The former includes *want*-type and *believe*-type verbs and the latter contains *persuade*-type verbs. *Persuade*-type verbs assign a thematic role to the controller, i.e. the postverbal NP. Also, *want*-type and *believe*-type verbs differ with respect to the categories of their complements. The former takes a CP complement but the latter selects an IP complement.[5]

2.2 Some Problematic *Persuade*-Type Verbs

Most previous studies have analyzed the causative *to*-infinitive verbs as belonging to the *persuade*-type. However, some of the causative *to*-infinitive verbs, like *order* and *force*, exhibit different behaviors from the *persuade*-type verbs with respect to the third diagnostic. The issue of which type of structure these problematic *persuade*-type verbs should take remains controversial, and accordingly, I will address the issue in this section.

2.2.1 *Order*

First, I will focus on the verb *order*. In order to make the issue explicit, let us submit the verb *order* to the three criteria.

(I)   Passivization of the subject of the infinitival clause
(33) a. I ordered the chauffer to fetch the car.
       b. The chauffer was ordered to fetch the car.

(Palmer 1974:184)

(II) Synonymity of embedded actives and passives
(34) a. I ordered the chauffer to fetch the car.
  ≠ b. I ordered the car to be fetched by the chauffer.

(Anderson 1985:33)

(III) The possibility of expletive *there* occurring in a postverbal position
(35) Susan ordered there to be a celebration in the park.   (Culicover 1976:238)

The results of the three diagnostics are summarized as below:

Table 2.

Diagnostics / Types	(I)	(II)	(III)
persuade	OK	not CS	*
want	*	CS	OK
believe	OK	CS	OK
order	OK	not CS	OK

As these results clearly indicate, *order* displays behavior distinct from any of the three diagnostics. Regarding (I) and (II), *order* behaves like *persuade*. However, concerning (I) and (III), it patterns with *believe*. How do we solve this discrepancy?

2.2.1.1   Previous Analyses

2.2.1.1.1   Hybrid Analyses: Huddleston (1971) and Bresnan (1979)

To support his hybrid analysis, Huddleston (1971) takes the following paradigm:

(36) a. I order you to return the money.
　　　b. I ordered the photographs to be destroyed.
　　　c. I ordered that the photographs be destroyed.

(Huddleston 1971:157)

According to his analysis, (36a) is interpreted as a three-argument construction with a direct relation in deep structure between *I* and *you*: *I* give the order to *you*. *Order* is thus patterning here with *persuade*-type verbs. However, the second example (36b) is apparently different. In this case, *I* did not give the order to *the photographs* and hence this is equivalent to (36c). Therefore, in these last two instances, *order* behaves like *believe*-type verbs.

Huddleston argues that in a situation of ordering, there are three inherent roles associated with the verb *order*, that is, the giver of the order, the recipient of the order, and the content of the order. The first must be a human NP, the second animate (and normally human too), and the third a complement clause. The recipient may optionally be left unrealized. If it is realized, *order* takes an object control complement, but if not, then *order* selects an ECM complement.

A similar but slightly different hybrid analysis can be seen in Bresnan (1979). Bresnan suggests that *order* takes both *persuade*-type and *want*-type structures. According to her analysis, when the Accusative NP is animate and is entitled to perform the event expressed by the infinitival complement, *order* takes an object control complement.

(37)   Linda ordered the men to leave the meeting.   (Bresnan 1979:158)

Contrastively, when the Accusative NP is inanimate as in (38) and thus cannot be interpreted as the recipient of the order, this verb does not select an object control complement.

(38)   She ordered the bodies to be dragged away.   (ibid.:159)

Unlike Huddleston (1971), Bresnan (1979) claims that, in that case, *order* takes a *want*-type structure because when an adverbial phrase intervenes between the verb and the Accusative NP, the preposition *for* must be overtly realized in front of the NP:

(39) a. *She ordered last night the bodies to be dragged away.
　　　b.   She ordered last night for the bodies to be dragged away.

(ibid.)

Notice, however, that there are sufficient reasons for taking this argument to be fallacious. Firstly, if *order* has a *want*-type structure, then we expect that *order* could occur in a subject control structure and thus take a covert pronoun PRO as the subject of its infinitival complement as in (40b). However, as the contrast between (40c) and (40d) obviously shows, *order* always needs an overt NP as the subject of its infinitival complement.

(40) a. I want him to leave.
　　　b. I want PRO to leave.

(Bošković 1996:278)

    c. *John ordered to win the race.   (Hyde 2000:39)
    d. John ordered his son to win the race.

Secondly, if *order* takes a *want*-type structure, then *order* would not permit passivization of the Accusative subject. But, in fact, *order* allows this kind of passivization even when the Accusative NP is inanimate.

(41) a. The chauffer was ordered to fetch the car.   (=33b)
      b. The flag was ordered to be hoisted.   (Zandvoort 1962:20)
      c. The floor was ordered to be cleaned.   (Dixon 1991:233)
      d. *Bill was wanted to read the book.   (Pesetsky 1991:17)

The sharp contrast between (40a,b)/(40c,d) on the one hand and (41a-c)/(41d) on the other indicates very clearly that *order* cannot take a *want*-type structure.

2.2.1.1.2 ECM only: Nakau (1994) and Nakamura (1999)

Unlike the hybrid analyses, Nakau (1994) and Nakamura (1999) insist that *order* should always take an ECM complement. The essence of their analyses is that the recipient of the order is determined not on the basis of the syntactic structures but by the pragmatic inference. To make this point clear, let us consider first the following examples.

(42) a. Susan ordered there to be a celebration in the park.   (=35)
      b. The prime minister ordered there to be an investigation into the explosion.   (Nakamura 1999:312)

(43) a. He ordered the prisoners to be set free.   (Nakau 1994:415)
      b. John ordered Mary to be fired.   (Culicover 1976:239)

It is apparent that all of these sentences do not have the recipients of the orders. Even in (43a,b) where *order* is followed by an animate NP, the NP cannot be interpreted as the recipient of the order. Accordingly, there is no doubt that the verb *order* takes an ECM complement here.

Second, let us examine the possibility of *order* taking a *persuade*-type structure. If the recipient of the order is determined by the pragmatic inference, then *order* needs not have a *persuade*-type structure. Regarding this point, Nakau (1994) presents the following paradigm:

(44) a. John ordered Bill to work harder.
      b. John ordered [Bill to work harder]
      c. John said to Bill, "You must work harder."
      d. John said to Tom, "Bill must work harder."

                        (Nakau 1994:421)

He argues that (44a) has the ECM structure shown in (44b). Moreover, (44a) can be synonymous either with (44c) or (44d). (44d) may be possible under the situation that *John* controls *Tom* and *Tom* controls *Bill*. On this ground, he claims that the recipient of the order should be determined not on the basis of the syntactic structure but by the pragmatic inference. A similar analysis is developed in Nakamura (1999). Significantly, however, all of my informants judge that (44a) can be synonymous with (44c) but cannot be with (44d) under any circumstance. Therefore, their evidence that the verb *order* cannot take a *persuade*-type structure seems to be wholly inadequate, and the issue of which type of structure the verb *order* should take remains unresolved.

2.2.1.2 Further Investigation

From the argument so far, the structural pattern for *order* is limited to two alternatives: the first one is that *order* takes both an object control complement (=*persuade*-type structure) and an ECM complement (= *believe*-type structure), and the second one is that *order* takes an ECM complement only. In this section, I will argue for the second ECM only analysis by submitting the verb *order* to the two additional syntactic diagnostics: *That*-clause alternation and sentential *it* anaphora.

(IV) *That*-clause alternation
(45) a. I believe him to be ill.
      b. I believe that he is ill.

                        (Huddleston and Pullum 2002:1226)

      c. *I believe John that he is ill.

(46)   a.   The officer persuaded the men to fire the guns.
       b.   *The officer persuaded that the men (should) fire the guns.
       c.   The officer persuaded the men that they (should) fire the guns.

(47)   a.   The officer ordered the man to fire the guns.
       b.   The officer ordered that the men (should) fire the guns.
       c.   *The officer ordered the men that they (should) fire the guns.

(V)   Sentential *it* anaphora
(48)   I believe Mary to have lied and John believes it too.
           (*it* = Mary to have lied)   (Gee 1977:468)

(49)   *I tried to persuade John to make a last attempt and Mary tried to persuade it too.
           (*it* = John to make a last attempt)   (ibid.)

(50)   The major ordered the troops to fire the guns and the captain ordered it too.
           (*it* = the troops to fire the guns)   (Sugawara 2014a:18)

The results are summarized in Table 3:

Table 3.

Diagnostics Types	(IV)	(V)
persuade	S V O *that*-clause	*
believe	S V *that*-clause	OK
order	S V *that*-clause	OK

As is evident from the Table 3, the behaviors of *order* concerning these two diagnostics are totally consistent with those of *believe*-type verbs.

To begin with, let us examine the results of the diagnostic (IV). In a *persuade*-type structure, the patient of the persuasion is syntactically realized as the indirect object of the matrix verb. The contrast between (46b) and (46c) illustrates this point. In contrast, in a *believe*-type structure, the theme of the believing is not syntactically realized, as the contrast between (45b) and (45c) illustrates. As to the verb *order*, the recipient of the order is not syntactically realized in the same way as the *persuade*-type structure, as shown in the contrast between (47b) and (47c). This fact clearly indicates that *order* cannot take a *persuade*-type structure.

Next, let us consider the results of the diagnostic (V). According Gee (1977), the antecedent of the sentential *it* anaphora should be a single constituent at D-structure. Thus in (48), *it* can refer to the infinitival complement *Mary to have lied*, whereas in (49), *it* cannot refer to the infinitival complement *John to make a last attempt*, since the complement consists of two constituents: *John* and *PRO to make a last attempt*. As for the sentence including *order* as its matrix verb, *it* can refer to the infinitival complement ((50)). This fact once again clearly indicates that *order* takes an ECM complement.

Returning now to the residual problem of cognitive synonymy, let us re-consider the examples in (51).

(51)   a.   John ordered the doctor to examine Mary.
      ≠ b.   John ordered Mary to be examined by the doctor.

As we have already seen, (51a) is not synonymous with (51b) as the recipients of the orders in these two sentences are different from each other. In (51a), it is *the doctor* who received an order, but, in (51b), *Mary* is interpreted as the recipient. Such behavior is parallel to that of *persuade*-type verbs:

(52)   a.   I persuaded a specialist to examine John.   (=6a)
      ≠ b.   I persuaded John to be examined by a specialist.   (=6b)

However, it is now evident that, unlike the *persuade*-type structure, the antonymy between (51a) and (51b) is not due to the syntactic properties but to the other factors. Even my informants who insist that (44a) is synonymous with (44c) but not with (44d) judge (47b) and (50) to be completely grammatical. This is a crucial piece of evidence to confirm that *order* always takes an ECM complement.

2.2.2 *Force*

Having got the issue as to the structural pattern for *order* out of the way, I now turn to another problematic *persuade*-type verb *force*. In order to highlight the issue of the structural pattern for *force*, let us begin with applying the diagnostics (I) to (III) to this verb:

(I)   Passivization of the subject of the infinitival clause
(53)   a.   John forced the specialist to examine the injured.
        b.   The specialist was forced to examine the injured.

(II)   Synonymity of embedded actives and passives
(54)   a.   John forced the doctor to examine Bill.
    ≠ b.   John forced Bill to be examined by the doctor.   (Culicover 1976:221)

(III)   The possibility of explitive *there* occurring in a postverbal position
(55)   The prime minister forced there to be an investigation into the explosion.   (Sugawara 2005:58)

The results are given below:

Table 4.

Diagnostics / Types	(I)	(II)	(III)
persuade	OK	not CS	*
want	*	CS	OK
believe	OK	CS	OK
order	OK	not CS	OK
force	OK	not CS	OK

Table 4 unquestionably indicates that *force* behaves like *order* with reference to the three diagnostics.

Here, we should notice that there are several studies that *force* should not allow expletive *there* to occur in the infinitival subject position, as shown in (56), and hence the structural pattern for *force* should be identical to a *persuade*-type structure.

(56)   *John forced there to be three men in the room.   (Culicover 1976:226)

Note, however, that the ungrammaticality of the sentence (56) cannot be attributed to the fact that the expletive *there* is placed at the postverbal position. In the first place, the infinitival complement of *force* can express a "process" as well as an "action" but cannot mean a "state." (57a-c) are the illustrations of this point.

(57)   a.   John forced the doctor to examine Bill.   (=54a)
        b.   The rock on his head forced Elvin to sink faster in the quicksand.   (Langaker 1975:368)
        c.   *The teacher forced Elvin to be a genius.

In the second place, as Nakau (1994) points out, the meaning of *there* construction can be divided into two types: "state" or "process." It follows from these two facts that whenever *force* takes *there* construction as its complement, the meaning of the compliment is limited to "process." Consequently, (56) is ungrammatical not because the subject of the infinitival complement is an expletive but because the infinitival complement expresses a stative event. The same applies to the complement of the verb *order*:

(58)   a.   Susan ordered there to be a celebration in the park.   (=42a)
        b.   The prime minister ordered there to be an investigation into the explosion.   (=42b)
        c.   *Susan ordered there to be a problem.   (Hyde 2000:49)

Contrastively, *persuade*-type verbs cannot allow expletives to appear in the postverbal positions even when the infinitival complements denote process events:

(59)   *We persuaded there to be a strike.   (Radford 1981:320)

Rosenbaum (1967) argues on the basis of two pieces of evidence that the verb *force* takes a *persuade*-type structure. The first is the fact that (54a) is not synonymous with (54b). However, as we seen in the previous section, the lack of synonymity does not ensure that *force* takes an object control complement. The second piece of evidence is that the pseudo-cleft sentence (60) is ungrammatical.

(60)   *What we forced was for John to ignore his work.   (Rosenbaum 1967:22)

Notice, however, that just because pseudo-clefting in (60) is impossible, it does not follow that *force* cannot take an infinitival clause as its sole complement. The first important point is that the verb *force* cannot allow the word order "for-NP-to-VP" as its complement:

(61)   *John forced for Mary to leave.   (Culicover 1976:215)

An even more important point is that if *force* takes a *persuade*-type structure, then (62b) or (62c) would be grammatical, but in fact, this is not the case.

(62)   a.   I forced him to come early.
        b.   *What I forced him was to come early.   (Palmer 1974:178)
        c.   *What I forced John was for him to come early.

These observations undoubtedly indicate that the two pieces of evidence cited in Rosenbaum (1967) in order to support the object control analysis of *force*'s complement are fairly inadequate.
    Now, let us apply diagnostics (IV) and (V) to the verb *force*.

(63)   a. *John forced that Mary would leave.   (Culicover 1976:215)
        b. *John forced Mary that she would leave.   (Sugawara 2005:59)

(64)   The major forced the troops to fire the guns and the captain forced it too.
            (*it* = the troops to fire the gun)

Contrary to the case of *order*, the infinitival complement of *force* cannot be paraphrased with the finite complements, as shown in (63a,b). As for the second diagnostic, *it* can refer to the infinitival complement, as illustrated in (64). Here, it is crucial to note that *the troops* is interpreted as a recipient of the action of forcing, and yet *it* can refer to the infinitival complement. This fact unequivocally confirm that the verb *force* takes nothing but an ECM complement.

2.3   Summary of Section 2

    In this section, I have re-examined the syntactic structures of the causative *to*-infinitive constructions in detail and demonstrate that causative *to*-infinitive verbs can be divided into two groups: one selects an object control complement ((65a)) and the other takes an ECM complement ((65b)). The former includes the verbs in (66a) and the latter contains the verbs in (66b).

(65)   a.   NP + V + NP$_i$ + [$_{CP}$ [$_{IP}$ PRO$_i$ + to VP]]
        b.   NP + V + [$_{IP}$ NP + to + VP]

(66)   a.   *persuade, convince, decide, determine, induce, influence*, etc.
        b.   *order, command, instruct, direct, force, drive, cause*, etc.

3.   The Semantic Structures of the Causative *to*-infinitive Verbs

    This section examines the semantic properties of the causative *to*-infinitive verbs and then elaborates their lexical semantic structures. In section 3.1, I will outline the semantic properties of the causative events in general. In section 3.2, I will offer the semantic classification of the causative *to*-infinitive verbs, which is relevant to the discussion in section 4.

3.1   Semantic Properties of Causation

    Causative verbs and causative constructions constitute one of the most discussed research areas, having undergone numerous analyses and classifications from various frameworks and perspectives[6]. Nevertheless, much still remains to be done on this area, and there is ample room for further investigation. In this section, following several significant previous analyses, I will explore the semantic properties of causation. As a beginning, let us re-examine the characterization of causation.
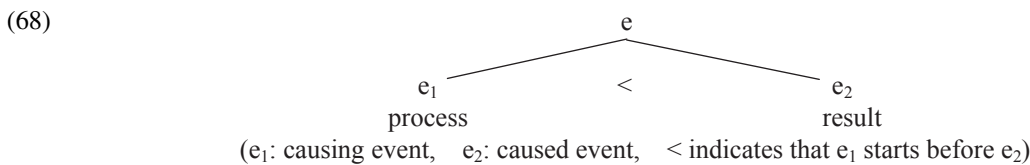
3.1.1 Refining the Characterization of Causation

Characterizing causation is not an easy matter, and as Kageyama (1996) points out, various characterizations of causation have been made by various linguists and philosophers in the traditional literature. In what follows, I seek to refine the characterization of causation as preliminaries to the following sections.

According to Shibatani (1976), two events can be said to constitute a causative situation if the following two conditions hold:

(67) a. The relation between the two events is such that the speaker believes that the occurrence of one event, the "caused event," has been realized at t_2 which is after t_1, the time of the "causing event."
   b. The relation between the causing and the caused event is such that the speaker believes that the occurrence of the caused event is wholly dependent on the occurrence of the causing event; the dependency of the two events here must be to the extent that it allows the speaker to entertain a counterfactual inference that the caused event would not have taken place at that particular time if the causing event had not taken place, provided that all else had remain the same. (Shibatani 1976:1–2)

Clause (67a) stipulates the time relationship between the two subevents, a causing event and a caused event (or a "resulting event"), which comprise the whole causative event, and states that the time of the causing event must precede the occurrence of the caused event. The temporal relationship between the two subevents can be represented schematically as in (68):

(68)

$$e$$
$$e_1 \qquad < \qquad e_2$$
$$\text{process} \qquad\qquad\qquad \text{result}$$

(e_1: causing event,　e_2: caused event,　$<$ indicates that e_1 starts before e_2)

On the other hand, clause (67b) stipulates that the causing event must be an actual and direct cause of the caused event, and thus there is no intervening event between the causing subevent and the resulting subevent. Furthermore, it implies that the caused event should actually be realized as a result of the causing event. To put it differently, (67b) requires that there should be a semantic entailment between the causing and the caused subevent. This is why the following sentence is completely unacceptable:

(69) ??A Pakistani man assassinated the former Prime Minister Benazirb Bhutto, but he actually did not die.

Based on this view, causative events can be represented by using commonly accepted semantic predicates CAUSE or RESULT FROM as follows:

(70) a. e_1 CAUSE e_2
   b. e_2 RESULT FROM e_1
   (e_1: causing event　e_2: caused event)

Following this kind of characterization of causation, a sentence like (71) is regarded not to be a causative sentence because it does not commit the speaker to the belief that the event of John's going occurred after their ordering him to do so.

(71) They ordered John to go.

The sentence, therefore, may be followed by *but he actually didn't go* without any contradiction. In contrast, sentences, such as (72a) and (72b), are taken to be causative sentences for the following two reasons. In the first place the situations denoted by the sentences must be such that the speaker believes that the event of John's going or the door's becoming open would not have occurred unless *I* did something to *John* or *the door*. Furthermore, these sentences commit the speaker to the belief that the event of John's going or the door's becoming open were actually carried out.

(72) a. I caused John to go.
   b. I opened the door.

(ibid.:2)

However, it is worth mentioning that there exist analyses that treat causation in broader sense than Shibatani (1976).

For instance, Talmy (1976, 1985, 1988, 2000), Croft (1990, 1991), and Langacker (1990b) claim that it is plausible to apply the semantic analysis of the physical causative events like (72b) to nonphysical, social events, such as (71) and (73a,b)[7].

(73) a. She persuaded me to go to the hospital.
      b. They forced him to resign.   (Langecker 1990b:220)

Here it should be noted that, in the sentences (71) and (73a), it is possible to say that the caused events may not be carried out, although the causing event can be viewed as a mediate or an immediate cause of the caused event. In this respect, Talmy (1976) cites the sentence (74) and points out that the verb *persuade* does not specify the actual carrying out of the caused event and thus it is possible to continue (74) with *but he later changed his mind and stayed*.

(74) I persuaded him to leave the building.   (Talmy 1976:105)

A similar view of causation can been seen in Song (1996). Song develops a functionally based typology based on a sample of 408 languages. She proposes that there should be three types of causative constructions: the *COMPACT*, *AND*, and *PURP* types (Song 1996:9). The first type includes the traditional lexical causatives[8], as exemplified by (72b), an instance of a change of location, and (75), an example of a change of state.

(75) The police woman killed the terrorist.   (Song 1996:9)

The second and the third type correspond to the so-called periphrastic causatives[9] and thus consists of two clauses. The *AND* type is instantiated by (72a) and (76a), while the *PURP* type is exemplified by (71), (73a) and (76c).

(76) a. John made Mary kick the man.
      b. Mary kicked the man.
      c. John told Mary to come over.
      d. Mary came over.

                                                                                        (ibid:136)

These two types are distinguished from each other in that, in the former, the causing event denoted by one clause and the resulting event denoted by the other are semantically coordinated, but in the latter, one clause represents an event carried out for the purpose of realizing the event denoted by the other (Song 1996:10). Consequently, the main difference between the two types is the presence or absence of implicativity. The *AND* type of causative construction is always fully implicative, and accordingly, the truth of (76b) holds whenever that of (76a) holds. On the other hand, the *PURP* type may not always be implicative; it may express a completely nonimplicative event (Song 1996:135–136). Thus, the truth of (76d) does not necessarily hold, even if that of (76c) holds.

A similar analysis on the periphrastic causatives is offered by Givon (1975). Building on the arguments developed in Karttunen (1971), he divides the periphrastic causative verbs into two types: *CAUSE* verbs like *force* and *cause*, and *TRY-CAUSE* verbs, such as *persuade* and *order*. The former is equivalent to the implicative verbs and the latter to the nonimplicative verbs[10].

Following this line of argument[11], the scope of causation in this paper ranges from the nonimplicative events to the implicative ones. In treating causation more widely, it is useful to introduce the semantic predicate CONTROL as is originally proposed by Kageyama (1996). In addition to the commonly used semantic predicate CAUSE, he posits the semantic predicate in order to describe a certain type of causative events in Japanese.

(77) e_1 CONTROL e_2 (cf. Kageyama 1996:86)

According to Kageyama (1996), (77) means that the causing event, e_1, directly affects the occurrence of the caused event, e_2, but does not necessarily entail that the caused event is actually carried out. In this paper, I will apply this idea to English causatives and treat causative events not only as the events denoted by (70) but as the events denoted by (77) as well (cf. Sugawara 2005, 2006).

(70) a. e_1 CAUSE e_2
      b. e_2 RESULT FROM e_1

3.1.2 More on Causation: Argument Coherence

Another characteristic of causation is given in the following statement:

(78) For a causal relationship to hold between two events, the causing event must have some elements in common

with the caused event; there can be no notion of a causal relation where this is not the case.

<div align="right">(Talmy 1976:58)</div>

Pustejovsky (1995) refers to this kind of property of causation as "argument coherence:"

(79) ARGUMENT COHERENCE:
      The relation expressed by the causing event and that expressed by the resulting event must make reference to at least one parameter in common. The reference can be direct or indirect.   (Pustejovsky 1995:186)

This statement is schematically represented in the event tree structure in (80).

(80)

$$
\begin{array}{ccc}
 & e & \\
e_1 & & e_2 \\
| & & | \\
R(x, y, \ldots) & & P(\ldots, y, \ldots)
\end{array}
$$
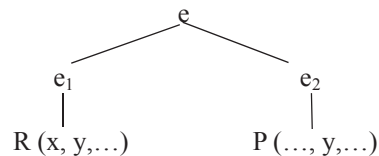
<div align="right">(ibid.)</div>

To summarize this section, causative events must have the following characteristics. Firstly, the causative event consists of two subevents: the causing subevent and the caused subevent. Secondly, there must exist a precedence relation between the causing subevent and the caused subevent: the time of the causing event must precede the occurrence of the caused event. Thirdly, causative events include not only implicative events but also nonimplicative ones. And finally, the two subevents of the causative event must share at least one participant. These properties must be reflected on the semantic representation of causation.

3.2 A Fine-Grained Semantic Classification of the Causative *to*-infinitive Verbs

As I noted in section 1, it has widely accepted in the traditional literature that the causative *to*-infinitive verbs take object control complement. Therefore, in this section, I will first overview the previous analyses dealing with the semantic properties of the object control verbs, and then go on to explore in depth the semantic structures of the causative *to*-infinitive verbs.

3.2.1 Previous Analyses: Foley and Van Valin (1984) and Sag and Pollard (1991)

A useful starting point for the discussion of the semantic properties of the object control verbs is afforded by Foley and Van Valin (1984), for they seek to develop a semantic theory of control, following the suggestion made by Radford (1981) that the question of whether a control predicate selects subject or object control will ultimately turn out to follow directly from the meaning of the predicate concerned.

Regarding the object control, Foley and Van Valin divided object control verbs into two groups: one with verbs of saying and the other with all other non-verbs-of-saying. According to their analysis, all of the latter have basically a causative meaning, ranging from strongly implicative verbs, like *force*, to nonimplicative verbs, like *persuade*, and they all have undergoer control[12].

(81) a. The burglar forced Larry to open the safe.
     b. Bill persuaded Max to sing.

<div align="right">(Foley and Van Valin 1984:307)</div>

They suggest that the fact that the causative verbs have undergoer control should follow from the semantics of causation, since the participant acted upon in the causing event is the actor of the caused event.

As for the verbs of saying, such as *order*, they argue that these verbs correspond to what Searle (1975) calls *directives*.

(82) Max ordered Fred to sit down.

<div align="right">(ibid:308)</div>

According to Searle, directives are regarded as an attempt by the speaker to get the hearer to do something. Given the semantics of directive illocutionary acts, it is natural that the verbs expressing such an act have undergoer control. Indeed, they are in essence a kind of 'verbal causative' in which the speaker tries to get the addressee to perform some action by means of an utterance. These verbs differ primary from the non-verbs-of saying in that with these the causing event is always a verbal act whereas with the others it is not. There is thus a strong common semantic linking between causative and directive verbs, all of which have undergoer control. In short, undergoer control is a feature of implicative causative verbs and nonimplicative directive speech-act verbs.

Building on the argument developed in Foley and Van Valin (1984), Sag and Pollard (1991) propose only one

semantic type for object control verbs, i.e. the INFLUENCE type. Relating to the semantics associated with this control type, they observed the following:[13]

(83)   Verbs of the INFLUENCE type all submit to a semantic analysis involving STATE OF AFFAIRS (SOAs) where a certain participant (the referent of the object) is influenced by another participant (the referent of the subject) to perform an action (characterized in terms of the SOA denoted by the VP complement) ... With respect to such SOAs, we may identify three semantic roles, which we will refer to as INFLUENCE (the possible agentive influencer), INFLUENCED (the typically animate participant influenced by the influence) and SOA-ARG (the action that the influenced participant is influenced to perform).

(Sag and Pollard 1991:66)

This type covers both causative verbs and directive speech-act verbs discussed in Foley and Van Valin (1984). Basically, this *influence*-type corresponds to the semantic type of causative *to*-infinitives, but it is possible to subdivide them further.

3.2.2   Subdivision of the Causative *to*-infinitive Verbs

In this section, causative *to*-infinitive verbs in English will be subdivided in terms of two semantic perspectives: *implicativity* and *affectedness of objects* (cf. Karttunen 1971, Hopper and Tompson 1980).

As I mentioned in 3.1.1, causative verbs can be divided depending on whether the verb in question is implicative or not into two groups. Consider the following paradigm:

(84)   a.   Mary induced John to go.
       b.   Mary forced John to go.
       c.   John went.
       d.   Mary persuaded John to go.
       e.   Mary ordered John to go.

Both (84a) and (84b) entail that the event expressed by the infinitival complement is actually carried out, or, to put it another way, there is apparent implication from (84a) or (84b) to (84c). The following judgements illustrate this point:

(85)   a. ?? Mary induced John to go, but he didn't.
       b. ?? Mary forced John to go, but he didn't.

Contrastively, there are no implications from (84d) or (84e) to (84c):

(86)   a.   Mary persuaded John to go, but he didn't.
       b.   Mary ordered John to go, but he didn't.

On the basis of these observations pertaining to the implicativity, the lexical conceptual structures for the two types of causative *to*-infinitive verbs can be represented as follows:

(87)   a.   Implicative, causative *to*-infinitive verbs (*induce*, *force*, etc.):
            [e_1 x ACT ON y]   CAUSE   [e_2 y DO-SOMETHING]

       b.   Nonimplicative, causative *to*-infinitive verbs (*persuade, order,* etc.):
            [e_1 x ACT ON y]   CONTROL   [e_2 y DO-SOMETHING]

(87a,b) shows that the semantic difference between implicative and nonimplicative causative *to*-infinitive verbs can be reduced to the difference of the semantic predicate CAUSE or CONTROL in their lexical conceptual structures.

Turning now to the second perspective, consider the following paradigm:[14]

(88)   ?? a.   Mary induced John to vote for the candidate, but he wouldn't.
          b.   Mary forced John to vote for the candidate, but he wouldn't.
       ?? c.   Mary persuaded John to vote for the candidate, but he wouldn't.
          d.   Mary ordered John to vote for the candidate, but he wouldn't.

(88a) and (88c) express in common the causative event in which the influenced participant undergoes a psychological change. To put it more concretely, both (88a) and (88c) imply that the influenced participant *John* accepts Mary's request and comes to feel like voting for the candidate. By contrast, sentences (88b) and (88d) do not entail such a psychological change. It follows from these observations concerning the affectedness of objects that the causing

subevent of the causative event denoted by the verb *induce* or *persuade* is more complex than that denoted by the verb *force* or *order*. Here it is noteworthy that the first two verbs can be viewed as experiencer-object psychological verbs in the sense that they describe the bringing about of a change in mental state (cf. Van Voorst 1992, Pesetsky 1995, Pylkkänen 2000). Traditionally, this type of psychological verb is analyzed as having a causative meaning and its lexical conceptual structure is considered to be as follows:

(89)   [x ACT ON y]   CAUSE   [y BECOME *PSYCHOLOGICAL STATE*]   (cf. Grimshaw 1990:26)

With this in mind, the previous semantic representation of the causing subevent can be reformulated as in (90) (cf. Sugawara 2007, 2008c):

(90)   a.   Causative *to*-infinitive verbs with no implication of a psychological change
             [e_1 x ACT ON y]   (*force*, *order*, etc.)
       b.   Causative *to*-infinitive verbs with the implication of a psychological change
             [e_1 [x ACT ON y]   CAUSE   [y BECOME *INDUCED/PERSUADED*]] (*induce*, *persuade*, etc.)

    Putting together the two semantic criteria, we can get four different types of causative *to*-infinitive verbs. The first and the second type correspond to implicative verbs, whereas the third and the fourth are equivalent to nonimlicative ones. The first two types are similar in that they describe the situation where the event denoted by the *to*-infinitive complement is actually carried out, but differ in whether they lexically specify that the influenced participant undergoes a psychological change: the first type lexicalizes it, but the second does not. I will refer to the first type as *induce*-type and to the second as *force*-type. The third and the fourth types share the same semantic property of expressing the causative situation in which the event denoted by the *to*-infinitive complement may not necessarily take place, yet there is a difference between the two types parallel to that between the first and the second types: the third type lexicalizes a psychological change in the influenced participant but the fourth type does not. I will refer to the third type as *persuade*-type and to the fourth as *order*-type. Table 5 summarizes these four types and (91) is a list of representatives of each type.

Table 5.   A fine-grained semantic classification of the causative *to*-infinitive verbs

Affectedness of objects / Implicativity	With the implication of a psychological change in an influenced participant	No implication of a psychological change in an influenced participant
implicative	(I) *induce*-type	(II) *force*-type
non-implicative	(III) *persuade*-type	(IV) *order*-type

(91)   a.   *induce*-type: *induce, influence*, etc.
       b.   *force*-type: *force, compel, oblige, drive, cause*, etc.
       c.   *persuade*-type: *persuade, convince, decide, determine*, etc.
       d.   *order*-type   *order, command, instruct, direct*, etc.

    Based on the arguments so far, the lexical conceptual structures (LCSs) for the four types of causative *to*-infinitive verbs can be represented as follows:

(92)   a.   LCS for *induce*-type verbs:
             [e_1 [x ACT ON y] CAUSE [y BECOME *INDUCED*]] CAUSE [e_2 y DO-SOMETNHING]

       b.   LCS for *force*-type verbs:
             [e_1 x ACT ON y] CAUSE [e_2 y DO-SOMETHING]

       c.   LCS for *persuade*-type verbs:
             [e_1 [x ACT ON y] CAUSE [y BECOME *PERSUADED*]] CONTROL [e_2 y DO-SOMETHING]

       d.   LCS for *order*-type verbs:
             [e_1 x ACT ON y] CONTROL [e_2 y DO-SOMETHING]

The appropriateness of the representations in (92) can be verified by the following adverbial modification test.

(93) a. John induced Mary to leave the building in ten minutes.
      b. John forced Mary to leave the building in ten minutes.
      c. John persuaded Mary to leave the building in ten minutes.
      d. John ordered Mary to leave the building in ten minutes.

Among these sentences, (93a) and (93c) are judged to be ambiguous: the adverbial phrase *in ten minutes* can modify both the causing and the caused event. In contrast, the sentences (93b) and (93d) are not ambiguous: in these two sentences, the adverbial phrase modifies only the caused event. These facts can be easily explained by assuming the lexical conceptual structures in (92). The causing event in the LCS for *induce* or *persuade*-type verbs takes the form of 'accomplishment' and thus it has an endpoint. Conversely, the causing event in the LCS for *force* or *order*-type verbs is merely an 'activity' and hence has no endpoint. As for the caused event in all the sentences, leaving the building, it takes the form of 'achievement' and thus has an endpoint (cf. Vendler 1967, Dowty 1979, Tenny 1994). Consequently, the adverbial phrase can modify the causing event as well as the caused event in (93a) and (93c), but can modify only the caused event in (93b) and (93d):

(94)

  a. $[e_1$ [x ACT ON y] CAUSE [y BECOME *INDUCED*]] CAUSE $[e_2$ y DO-SOMETNHING]
        |_____ in ten minutes _____|

  b. $[e_1$ x ACT ON y] CAUSE $[e_2$ y DO-SOMETHING]
        |_____✕_____ in ten minutes _____|

  c. $[e_1$ [x ACT ON y] CAUSE [y BECOME *PERSUADED*]] CONTROL $[e_2$ y DO-SOMETHING]
        |_____ in ten minutes _____|

  d. $[e_1$ x ACT ON y] CONTROL $[e_2$ y DO-SOMETHING]
        |_____✕_____ in ten minutes _____|

4.   The Interaction between Syntax and Semantics in the Causative *to*-infinitives

Having explicated the syntactic and semantic structures of the causative *to*-infinitives, I am now in a position to address the issue of how these two structures correlate with each other.

In section 2, I examined the syntactic structures of the causative *to*-infinitive constructions and demonstrated that the verbs occurring in this kind of constructions can be divided into two groups: one that takes an object control complement and the other that selects an ECM complement.

(95) a. NP + V + NP$_i$ + [$_{CP}$ [$_{IP}$ PRO$_i$ + to + VP]]   (Object Control)
      b. NP + V + [$_{IP}$ NP + to + VP]   (ECM)

What differentiates an object control structure from an ECM structure is the grammatical status of the postverbal NP. In the case of the object control structure, the postverbal NP occurs outside the infinitival complement and occupies the indirect object position, whereas the postverbal NP in the ECM structure appears in the subject position of the infinitival complement. Hence, an object control verb is a triadic verb, taking two NP arguments and one clausal argument, while an ECM verb is a dyadic verb, taking one NP argument and one clausal argument.

According to Levin and Rappaport (1995, 1996, 2005, 2011), lexical causative verbs like *break* have a complex lexical representation involving the semantic predicate CAUSE, where the meaning of such verbs is characterized as having two subevents, each represents an argument of the predicate CAUSE. In this bieventive analysis of the lexical causative verb, each argument of the verb is associated with a distinct subevent: the causer argument is associated with the causing subevent, and the patient or the theme argument which undergoes the change of state or change of location with the caused subevent. For instance, the lexical conceptual structure for the verb *break* can be represented as follows:

(96)   [x ACT ON y] CAUSE [y BECOME *BROKEN*]

Although the external argument of such a verb is merely a participant in the causing event, this participant can be viewed as representing the whole causing subevent via the process of metonymy. Wilkins and Van Valin (1993) refers to the semantic operation of one of the arguments of the causing subevent standing in for the entire event as "metonymic clipping[15]." As a result of this operation, the representation of (96) can be modified as in (97) (cf. Rappaport et al. (eds.) 2010:24).

(97) [x ACT] CAUSE [y BECOME *BROKEN*]

I propose that metonymic clipping occur obligatorily in the causing subevent of a causative event if the subevent is represented as [x ACT ON y] (cf. SUGAWARA 2006, 2008a).

Rappaport Hovav and Levin (RH&L) (1998) posit a well-formedness condition on the mapping from lexical conceptual structure (in their term "event structure") to syntax which they call *Argument Realization Condition*[16]:

(98) Argument Realization Condition:
  a. There must be an argument XP in the syntax for each structure participant in the event structure.
  b. Each argument XP in the syntax must be associated with an identified subevent in the event structure.

(RH&L 1998:113)

By employing the semantic operation of metonymic clipping and the argument realization condition, I now illustrate how the structural difference between (95a) and (95b) reflects event complexity among the lexical conceptual structures in (92a-d):

(99) a. *induce*-type:
    【Syntactic structure】
    NP + V + NP$_i$ + [$_{CP}$ [$_{IP}$ PRO$_i$ + to + VP]]
          ↑ ← *mapping*
    【Lexical conceptual structure】
    [$_{e1}$ [x ACT] CAUSE [y BECOME *INDUCED*]] CAUSE [$_{e2}$ y DO-SOMETHING]
          ↑ ← *metonymic clipping*
    [$_{e1}$ [x ACT ON y] CAUSE [y BECOME *INDUCED*]] CAUSE [$_{e2}$ y DO-SOMETHING]

  b. *force*-type:
    【Syntactic structure】
    NP + V + [$_{IP}$ NP + to + VP]
          ↑ ← *mapping*
    【Lexical conceptual structure】
    [$_{e1}$ x ACT] CAUSE [$_{e2}$ y DO-SOMETHING]
          ↑ ← *metonymic clipping*
    [$_{e1}$ x ACT ON y] CAUSE [$_{e2}$ y DO-SOMETHING]

  c. *persuade*-type:
    【Syntactic structure】
    NP + V + NP$_i$ + [$_{CP}$ [$_{IP}$ PRO$_i$ + to + VP]]
          ↑ ← *mapping*
    【Lexical conceptual structure】
    [$_{e1}$ [x ACT] CAUSE [y BECOME *PERSUADED*]] CONTROL [$_{e2}$ y DO-SOMETHING]
          ↑ ← *metonymic clipping*
    [$_{e1}$ [x ACT ON y] CAUSE [y BECOME *PERSUADED*]] CONTROL [$_{e2}$ y DO-SOMETHING]

  d. *order*-type:
    【Syntactic structure】
    NP + V + [$_{IP}$ NP + to + VP]
          ↑ ← *mapping*
    【Lexical conceptual structure】
    [$_{e1}$ x ACT] CONTROL [$_{e2}$ y DO-SOMETHING]
          ↑ ← *metonymic clipping*
    [$_{e1}$ x ACT ON y] CONTROL [$_{e2}$ y DO-SOMETHING]

In the semantic structures for the *force*-type and the *order*-type, the patient argument in the causing subevent is removed by the metonymic clipping and thus there is no indirect object in their syntactic structures. On the other hand, in the semantic structures for the *induce*-type and the *persuade*-type, the influenced argument in the causing subevent remains even after the operation of metonymic clipping. Thus this argument maps onto the indirect object position, resulting in the object control structure.

5. Conclusion and Consequence

In this paper, I have scrutinized the syntactic and semantic properties of the English causative *to*-infinitives on the basis of empirical data. By elaborating the semantic structures of the causative *to*-infinitive verbs, and by adopting the semantic operation of metonymic clipping and a well-formedness condition on the syntactic realization of semantic structures, I made a certain success in clarifying the mapping mechanism between the semantic structures and the syntactic structures of the English causative *to*-infinitives. I have concluded that the structural difference between the *induce/persuade*-type and the *force/order*-type, that is, the difference between the object control structure and the ECM structure stems from the difference among their lexical conceptual structures.

Kageyama (2005) suggests the possibility of unifying verbs' lexical conceptual structure and qualia structure, but he failed to present enough supporting evidence. This paper along with Sugawara (2007, 2008a,c) strongly boost his insightful idea by employing the semantic predicate CONTROL and the Qualia Structure including a Telic role[17], and by introducing the distinction between True Argument and Default Argument[18] as in (100a-d):[19,20,21,22]

(100)
a.   Semantic structure for *induce*-type verbs:

$$\text{EVENTSTR} = \begin{bmatrix} E_1 = e_1\text{: transition} \\ E_2 = e_2\text{: event} \\ \text{RESTER} = <_\propto \end{bmatrix}$$

$$\text{ARGSTR} = \begin{bmatrix} \text{ARG } 1 = x \\ \text{ARG } 2 = y \\ \text{ARG } 3 = z = e_2 \end{bmatrix}$$

$$\text{QUALIA} = \begin{bmatrix} \text{CONSTITUTIVE} = [e_1 [x \text{ ACT (ON } y)] \text{ CAUSE } [y \text{ BECOME } \textit{INDUCED}]] \\ \qquad\qquad \text{CAUSE } [e_2 \ y \text{ DO-SOMETNHING }] \\ \text{FORMAL} = \text{result } (e_1, y) \wedge \text{result } (e_2, y, z) \\ \text{AGENTIVE} = \text{act } (e_1, x, y) \end{bmatrix}$$

b.   Semantic structure for *persuade*-type verbs:

$$\text{EVENTSTR} = \begin{bmatrix} E_1 = e_1\text{: transition} \\ E_2 = e_2\text{: event} \\ \text{RESTER} = <_\propto \end{bmatrix}$$

$$\text{ARGSTR} = \begin{bmatrix} \text{ARG } 1 = x \\ \text{ARG } 2 = y \\ \text{ARG } 3 = z = e_2 \end{bmatrix}$$

$$\text{QUALIA} = \begin{bmatrix} \text{CONSTITUTIVE} = [e_1 [x \text{ ACT (ON } y)] \text{ CAUSE } [y \text{ BECOME } \textit{PERSUADED}]] \\ \qquad\qquad \text{CONTROL } [e_2 \ y \text{ DO-SOMETNHING }] \\ \text{FORMAL} = \text{result } (e_1, y) \\ \text{AGENTIVE} = \text{act } (e_1, x, y) \\ \text{TELIC} = \text{act } (e_2, x, y, z) \end{bmatrix}$$

c.   Semantic structure for *force*-type verbs:

$$\text{EVENTSTR} = \begin{bmatrix} E_1 = e_1\text{: process} \\ E_2 = e_2\text{: event} \\ \text{RESTER} = <_\propto \end{bmatrix}$$

$$\text{ARGSTR} = \begin{bmatrix} \text{ARG } 1 = x \\ \text{ARG } 2 = z = e_2 \\ \text{D-ARG } 1 = y \end{bmatrix}$$

$$\text{QUALIA} = \begin{bmatrix} \text{CONSTITUTIVE} = [e_1 \ x \text{ ACT (ON } y)] \text{ CAUSE } [e_2 \ y \text{ DO-SOMETNHING }] \\ \text{FORMAL} = \text{result } (e_2, y, z) \\ \text{AGENTIVE} = \text{act } (e_1, x, y) \end{bmatrix}$$

d.   Semantic structure for *order*-type verbs:

$$
\text{EVENTSTR} = \begin{bmatrix} E_1 = e_1\text{: process} \\ E_2 = e_2\text{: event} \\ \text{RESTER} = <_\alpha \end{bmatrix}
$$

$$
\text{ARGSTR} = \begin{bmatrix} \text{ARG } 1 = x \\ \text{ARG } 2 = z = e_2 \\ \text{D-ARG } 1 = y \end{bmatrix}
$$

$$
\text{QUALIA} = \begin{bmatrix} \text{CONSTITUTIVE} = [e_1 \text{ x ACT (ON y) }] \text{ CONTROL } [e_2 \text{ y DO-SOMETNHING }] \\ \text{AGENTIVE} = \text{act } (e_1, x, y) \\ \text{TELIC} = \text{act } (e_2, x, y, z) \end{bmatrix}
$$

I hope this type of semantic representations will point to fruitful directions for future lexical semantic research.

Notes

1. As for the treatment of PRO, see, for example, Chomky (1981), Manzini (1983), Bošković (1995, 1996), Ormazabal (1995), Hornstein (1999), Martin (2001), Davies and Dubinsky (2004), Radford (2009), Landau (2013), Reed (2013).

2. 'CS' is the abbreviation of 'cognitively synonymous.'

3. 'Cognitively synonymous:' one is true if and only if the other is true.   (Chomsky 1965:22)

4. Notice in (23) that IP is not a barrier for government.

5. Owing to this categorical difference, the Case assigners to the Accusative subjects in these two types' structures are different from each other. In a *want*-type structure, the covert counterpart of the preposition *for* is alleged to assign an Accusative Case to the infinitival subject. By contrast, in a *believe*-type structure, the matrix verb exceptionally assigns an Accusative Case to the corresponding subject. For further details of the Case assignment in a *want*-type and *believe*-type structure, see e.g. Chomsky (1981).

6. See, for example, Shibatani (1973, 1976), Comrie (1976), Comrie and Polinsky (1993), Song (1996), and Lemmens (1998). The first five provide typology of causative verbs and causative constructions with reference to a variety of languages. The sixth is concerned with causative verbs and causative constructions in English, especially with the English lexical causatives. See also Talmy (1976, 1988, 2000), Goldsmith (1984), Croft (1990, 1991, 2012), Langacker (1990a,b, 2008), Ritter and Rosen (1993), Tenny (1994), Pustejovsky (1995), Van Voorst (1995), Shibatani (2001), Shibatani (ed.) (2001), Dixon (2005, 2010, 2012), Goldberg (2006), Rapapport et al. (eds.) (2010), Goddard (2011), Pinker (2013).

7. To capture the transitivity of transitive and causative events, Talmy (1988) sets out a family of 'force-dynamic relations', which describe the interactions between two participants with respect to force. Similarly, Langacker (1990b) introduces the conception of 'action chain' ('billiard-ball model'), which describe a series of energetic interaction: one participant transfers energy to a second, thus inducing a reaction whereby it in turn transfers energy to a third, and so on in definitely until a participant is reached whose reaction entails no further energy transmission. See Talmy (2000) for further elaboration of force dynamic relations. See also Croft (1990, 1991, 2012) for the similar notion of 'causal chain.'

8. See endnote 9.

9. A large number of languages including English have two types of linguistic forms to encode causative situations. The first one is that in which the matrix causative verb incorporates both cause and effect into its meaning. This type of causative form is monoclausal and is traditionally called "lexical causatives." The second one takes a morphosyntactically more complex, biclausal structure, where the matrix clause contains the verb such as *make* and *force* and expresses the causing subevent, while the embedded clause includes the other verb and describes the resulting subevent. This type of causative form is traditionally referred to as "analytic causatives" or "periphrastic causatives." The sentence (ia) is an example of the lexical causatives and (ib) of the periphrastic causatives:

(i)   a.   John killed Bill on Sunday.
      b.   John caused Bill to die on Sunday.

                    (Shibatani 1976:15)

For detailed discussion on the semantic similarities and differences between the lexical and periphrastic causatives, see e.g. MacCawley (1968), Fordor (1970), Katz (1970), Lakoff (1970), Baron (1974), Shibatani (1976), Dixon (2010, 2012).

10. For detailed discussion on implicativity, see Karttunen (1971).

11. See also Shibatani (2001), Shibatani and Chung (2002), and Shibatani and Pardeshi (2001).

12. In the theory of Role and Reference Grammar (RRG) developed by Foley and Van Valin, there are two levels of representations: logical structure and syntactic structure. The logical structure including undergoer control maps onto

the syntactic structure which is equivalent to the object control structure.

13. Within the Head-Driven Phrase-Structure Grammar (HPSG) framework, Sag and Pollrad consider the complement of an object control verb to be a VP, but not a sentential constituent. However, taking much of the traditional and current studies outside of the HPSG framework into consideration, it is reasonable to assume that the complement in question should be a clause (CP) rather than a VP.

14. It should be noticed that (88b) expresses an event in which *Mary* made *John* to vote for the candidate against his will. See the following definition of *force*.

   force: to make someone do something that they do not want to do, especially by threatening them.   (*LDCE*)

15. A similar idea is seen in Weinreich (1963), where he develops the theory of "nesting."

16. A similar formulation can be seen in Rappaport Hovav and Levin (2001).

   The Argument-Per-Subevent Condition: There must be at least one argument XP in the syntax per subevent in the event structure.   (RH&L 2001:779)

17. Among works on lexical semantics within the generative perspective, one of the most innovative and elaborated lexicon models is the Generative Lexicon (GL) (Pustejovsky 1995, Busa et al. 2001, Geeraetes 2010, Pustejovsky et al. (eds.) 2013, Pustejovsky and Jezek (forthcoming)), which incorporates lexical entries that are richer in informational content and, at the same time, more richly structured. In the GL model, there are three levels of semantic representations for each lexical item: Event Structure, Argument Structure, and Qualia Structure. The hallmark of the GL model is the presence of a Qualia Structure which is absent in the other lexicon models (cf. Jackendoff 1997, 2002, 2010, Tenny and Pustejovsky (eds.) 2000, Pustejovsky 2001, Croft and Cruse 2004, Culicover and Jackendoff 2005, Kageyama 2005, Goldberg 2006, Peeters (ed.) 2007, Sugawara 2007, 2008a,b,c, 2013a,b, 2014b, Cruse 2011). This structure includes not only linguistic or lexical knowledge but also encyclopedic, real-world knowledge. It specifies four essential aspects of a word's meaning (or *qualia*): CONSTITUTIVE, FORMAL, TELIC, and AGENTIVE. (Pustejovsky 1995:76). The TELIC role for verbs is assumed to be as follows:

   TELIC: Purpose that an agent has in performing an act   (Pustejovsky 1995:86)

18. The GL model distinguishes four types of arguments for lexical items: TRUE ARGUMENT, DEFAULT ARGUMENT, SHADOW ARGUMENT, and TRUE ADJUNCT. The difference between the TRUE and the DEFAULT ARGUMENT is as follows:

   (i)   TRUE ARGUMENTS: Syntactically realized parameters of the lexical item

   (ii)   DEFAULT ARGUMENTS: Parameters which participate in logical expressions in the qualia, but which are not necessarily expressed syntactically   (Pustejovsky 1995:63)

19. Notice in (100) that the Event Structure of all four types of verbs indicates that the temporal relationship between the two subevents holds properly: the time of the causing event e_1 precedes the occurrence of the caused event e_2. Notice also that the causing event of the *induce/persuade*-type verbs denotes a *transition* which consists of a *process* and a *state* and thus corresponds to an 'accomplishment' event, whereas that of the *force/order*-type verbs denotes just a *process* which is equivalent to an 'activity' event (Recall the discussion developed in section 3.2.2).

20. Notice in (100) that in the Argument Structures of the four types of verbs, the Argument z (= e_2) coincides with the Sag and Pollard's (1991) SOA-ARG mentioned in 3.2.1. Notice also that the Argument Structure for the *induce/persuade*-type verbs ensures that these two types of verbs are triadic verbs, while that for the *force/order*-type verbs confirms that these two types of verbs are dyadic verbs.

21. As I overviewed in section 3.1.1, the *induce/force*-type verbs are identical to Givon's (1975) *CAUSE* verbs, while the *persuade/order*-type verbs are equivalent to Givon's (1975) *TRY-CAUSE* verbs and Song's (1996) *PURP*-type verbs. In the Qualia Structures in (100), the semantic predicate CAUSE in the CONSTITUTIVE role correlates with the FOMAL role, whereas the semantic predicate CONTROL is linked to the TELIC role.

22. Notice in (100) that the AGENTIVE role and the FOMAL/TELIC role in the Qualia Structures indicate that the Argument Coherence mentioned in section 3.1.2 holds appropriately as the causing event e_1 and the caused event e_2 share the same argument (or 'parameter') y.

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