A Clausal Analysis of Resultative Constructions with X–key*: Evidence from Corpus and Experiments

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Lee, Juwon; Oh, Eunjeong; Song, Sanghoun(2018), “A Clausal Analysis of Resultative Constructions with X–key: Evidence from Corpus and Experiments,” Language & Information Society 35. Quite a few prior studies have classified the Korean resultative constructions into predicative resultatives and clausal resultatives. However, the current study argues that all the resultative constructions with X–key belong to the category of clausal resultative construction. This implies that X–key forms a fully saturated clause (not object control), in which the nominative subject of the secondary predicate can be omitted since Korean is a pro-drop language. We present corpus data and experimental results to reveal the existence of pro-drop in the resultative constructions. The linguistic findings are also consistent with the prediction of the pro-drop analysis: various kinds of resultative predicates can appear in the resultative constructions.

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1. Introduction

Just as with the resultative constructions in English, resultative constructions in Korean have been classified into two types in the literature: predicative resultative construction like (1a) and clausal resultative construction like (1b) (see the types of resultative constructions in Wechsler and Noh 2001).1)

(1) a. ku-ka chelphan-ul napcakha-key twutulki-ess-ta.
    he-Nom metal-Acc flat-Key hammer-Pst-Dec

1) In addition to the two types of resultative constructions, English has what is called Exceptional Case Marking (ECM) resultative construction like the following:

(i) John ran his Nikes threadbare.

Although the verb ran is basically an intransitive verb, the NP his Nikes behaves like an object in the resultative sentence. It seems, however, that ECM resultative construction is not allowed in Korean (Kim 1993; Wechsler and Noh 2001):

(ii) *John-i sinpal-ul talh-key talli-ess-ta.
     John-Nom shoe-Acc threadbare-Key run-Pst-Dec
     (int.) ‘John ran his shoes threadbare.’

In this paper, it is assumed that Korean has no ECM resultative construction, and we focus on canonical transitive resultative constructions like (1a).
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'He hammered the metal flat.'

   he-Nom shoes-Nom threadbare-Key run-Pst-Dec

'He ran so that (his) shoes became threadbare.'

The predicative resultative constructions like (1a) have been normally considered to involve a control structure. In the control analysis, the subject of the resultative predicate napčakha-key in (1a) never appears in the sentence, and the subject argument of the secondary predicate is co-indexed with the matrix object. That is, the subject of napčakha-key ‘flat-Key’ is never structurally present, and so it forms an unsaturated structure in Head-driven Phrase Structure Grammar (HPSG) (see Wechsler and Noh 2001:404–406). However, in the clausal resultative sentence (1b), the fully saturated result clause consists of the nominative NP sinpal-i ‘shoes-Nom’ and the resultative predicate talh-key ‘threadbare-Key’ (see Wechsler and Noh 2001:404–406). Despite of this difference, they basically describe a resultative event: the event of the main verb results in the change of state denoted by the result predicate. More specifically, in (1a) the hammering event caused the metal to become flat, and in (1b) the running event caused the shoes to become threadbare.

In stark contrast to the two distinct analyses of X-key resultative constructions, Lee(2016) proposed a unified analysis of the Korean resultative constructions: all the resultative constructions with X-key are clausal resultative construction. In other words, what has been considered as predicative resultative construction is actually a kind of
clausal resultative construction in Korean. While various theoretical accounts for the clausal analysis of X-key resultative constructions have been proposed (see e.g., TP adjunct analysis in Shim and den Dikken 2007; Shibagaki 2011 or small clause complement analysis in Son 2008), in this paper both corpus data and experimental evidence further strengthen the syntactic hypothesis in Lee(2016): the resultative predicate X-key is the head of a fully saturated clause (or sometimes a pro-dropped clause since Korean is a pro-drop language).2)3)

In Section 2, the main issue of this paper is presented in more detail. In Section 3, we report some corpus findings of Korean resultative constructions with X-key in favor of the aforementioned unified analysis. In Section 4 we also argue with experimental evidence that resultative constructions with X-key are all clausal resultative construction. We verify some predictions of the unified analysis in Section 5 and conclude in Section 6.

2) In addition to this pro-drop analysis, Lee(2016) argued for the other two syntactic hypotheses: X-key is syntactically an adverb, and X-key (or the phrase headed by X-key) is a complement of the main verb in a resultative sentence. The present study exclusively makes the pro-drop analysis, and the other two are separately examined in Lee et al.(2018).

3) X-key can also be used in other constructions like the persuade construction or the force construction, which have been considered to have an object control structure in Korean. We believe that X-key in these constructions also forms a fully saturated clause, and this issue will be discussed in future work.
2. Issues

Before we present empirical evidence in the following sections, what counts as evidence for the unified analysis is summarized in this section. First, consider the canonical object control sentences in the following (see more about controls in Bresnan 1982; Horstein 1999; Davies and Dubinsky 2004; Polinsky and Potsdam 2006, among others):

(2) a. John persuaded her to read the book.
    b. John forced her to read the book.

In (2) the accusative object of the matrix clause serves as the predication subject of the to–infinitive VP. A crucial property of the object control is that the subject of the infinitive VP must not appear in the sentence, as illustrated in (3).

(3) a. John persuaded her₁ ("Jane₁ / "her₁) to read the book.
    b. John forced her₁ ("Jane₁ / "her₁) to read the book.

In addition, the explicit object of the matrix clause must be co–indexed with the subject argument of the to–infinitive VP as shown in the following. Note, however, that the gap in (4) is used for expository purposes: we assume that the silent subject is not present in the structure, following the approach to controls in HPSG (see Pollard and Sag 1994).
(4) a. John persuaded Jane [ ____i/ji/jk to read the book].
   b. John forced Jane [ ____i/ji/jk to read the book].

By contrast, the pro-dropped expression can explicitly appear in a sentence, as illustrated in (5a), and the pro-dropped expression is not required to refer to the same referent of an expression in the same sentence, as shown in (5b).

   Jessica-Top self-Acc / he-Acc love-Pre-Dec
   ‘Jessica loves herself/him.’

b. Jessica-nun, ____i/ji salangha-n-ta.
   Jessica-Top love-Pre-Dec
   ‘Jessica loves herself/him.’

These two grammatical differences between object control and pro-drop are used here as the main criteria to examine Korean resultative constructions with X-key and to show that they involve pro-drop, rather than object control.

3. Corpus Analysis

With regard to the issue under discussion, the corpus findings of Korean resultative constructions are presented in this section. These naturally occurring data from the Sejong Spoken Corpus (consisting of approximately 0.8 million words) imply that in transitive resultative
sentences with X−key, the object NP of the matrix clause and the subject NP of the result clause can optionally appear, and the two NPs can be, but not necessarily, co-indexed. We take these data as evidence for the unified analysis of Korean resultative constructions with X−key.

3.1. Corpus annotation

The initial step of corpus annotation was to extract the utterances in which the −key suffix (tagged as EC) appeared. The utterances with the suffix was found 4,759 times in the Sejong Spoken Corpus. After collecting the utterances, we transplanted the data into a database and then created an online workbench for the ease of annotation (APACHE+MySQL+PHP).

As a preliminary tagging step, two annotators worked on the workbench. First, they annotated which verbs behave as the main predicate and the secondary predicate when it comes to the −key suffix. Along with this, they also discerned between causative sentences and non-causative sentences. This process was iterated twice by the two different annotators. Second, the two annotators confirmed whether the argument was repeated inside the −key clauses, and otherwise whether the argument could appear again.

The remaining annotation was directly administered by the first author of this article. Referring to the two preliminary annotators’ judgments, the pro-drop analysis was made with reference to the utterances. In addition to this, the types of the −key constructions were minutely identified. The following analysis is based on the data.
annotated thus far.

3.2. Resultative constructions with no NP

As discussed hitherto, the present study is exclusively concerned with the resultative sentences with X-key. Notably, not all sentences with X-key involve a resultative interpretation. In (6a) ppalu-key ‘quick-Key’ is a manner adverb, and in (6b) emchenga-key ‘extreme-Key’ is a degree adverb. They specify the events denoted by the predicates. No cause-effect relation is expressed in the sentences.

(6) a. ku-ka ppalu-key talli-ess-ta.
    he-Nom quick-Key run-Pst-Dec
    ‘He ran quickly.’

b. ku-ka emchenga-key ppalu-ta.
    he-Nom extreme-Key fast-Pst-Dec
    ‘He is extremely fast.’

However, the examples with X-key below are basically a resultative construction since the event of the main verb causes the event of the X-key. Recall that the subject or the object of a sentence can be freely omitted from the sentence in Korean, a pro-drop language, if the removed NP can be inferred from the utterance context. Likewise, it is possible that the matrix object and the subject of the resultative predicate do not explicitly appear in a Korean resultative construction, as shown in the following corpus data:4)
(7) a. [ ____jxccalp-key] ____j calun ke kathuntey. short-Key cut-Rel thing seem
   ‘It seems that he cut it short.’ (128)
b. [ ____ipathyoha-ki coh-key] mwe ilehkay ferment-Nom good-Key something like this
   ____i cal sekkecwu-ko well mix-and
   ‘You mix it like this so that it can be fermented well, and....’ (1083)
c. ciwukay-lo hanpen ____j [ ____j hulisha-key]
eraser-Inst one time blurry-Key
   ciwumyeny, erase.if
   ‘If you erase it one time so that it becomes blurry,....’ (1903)

In each of the clauses in (7), the two omitted NPs seem to refer to the same entity in the discourse. For instance, it is most natural to assume that in (7a), the referent of the subject cut something so that it became short. However, co-indexation of the kind is not necessary for resultative constructions, as illustrated in (8).

(8) a. [ ____j ippu-key] ____k ip-ko wa-ss-kwuna.
   pretty-Key wear-and come-Pst-Dec
   ‘You wore it so that you look pretty and came.’ (79)

4) The numbers in parenthesis in (7) and the subsequent examples in this section are the indices of the utterances extracted from the Sejong Spoken Corpus.
b. [____i pyello cwup-key] ____k an particularly cold-Key Neg ip-ko wa-ss-nuntey.
wear-and come-Pst-Dec
‘He did not wear it so that he felt cold.’ (1474)
c. [____i ttuttusha-key] ____k ip-e.
warm-Key wear-Dec
‘Wear it so that you become warm.’ (2681)

In (8a), for instance, we can infer that the referent of the subject in the matrix clause wore clothing of some kind so that he or she looks pretty. Though the NPs do not appear in the sentences, they should be a kind of resultative sentence since they describe a cause–effect relation between the matrix and result clauses.

3.3. Resultative constructions with only one NP

Typical resultative constructions in Korean have an explicit object NP in the matrix clause, but no explicit subject of the resultative predicate appears in the result clause:

(9) a. ceyphwum-ul, [____i cal comyengpal pat-key] product-Acc well light receive-Key

5) As a reviewer pointed out, it seems possible for the understood subject of ippu-key ‘pretty-Key’ to be the clothing rather than the addressee. However, what is important here is the fact that the understood subject of ippu-key ‘pretty-Key’ can be the addressee and the co-indexation is not required in the resultative sentence.
e tisuphulleyi-lul hay nwa-ss-ki ttaymwnuy
um displaying-Acc do put-Pst-Comp because
‘Because he displayed the products so that they received
the lights well....’  (1139)
b. na-to kwuk; [ ___j ilehkey elkhunha-key]
I-also soup like this spicy-Key
kkulhye pwassumyen cohkeyss-ta.
boil see.if good-Dec
‘It would be great if I could make the soup spicy like
this.’  (1590)
c. mwusun kye hoyk-ul; ccatwu tolwussumyen
some plan-Acc make if possible
[ ___j com lwucuha-key].
  a little loose-Key
‘You make plans a little loose, if possible.’  (1618)

The accusative NPs in (9) serve as the predication subjects of the
resultative predicates via the co-indexation. Although in (9b) kwuk ‘soup’
does not have a case marking, it is most natural to assume that it is the
object of the matrix verb, rather than the subject of the resultative
predicate. Again, co-indexation is not required for this kind of
resultative construction, as shown in the following:

(10) a. mwuwu-lul; [ ___k khu-key] ssel-e kacikwu
radish-Acc big-Key cut-Comp then
‘He cut the radish so that the pieces are big, and
then...’  (230)

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b. *kunyang mwul-man j ppay-ss-e.*
   just water-only remove-Pst-Dec
   [ ___k nolah-key]
   yellow-Key
   (lit.) 'I just removed water so that it became yellow.'
   (300)

c. *ku sinpal-ul] [ ___k ttattusha-key] sinulako*
   the shoes-Acc warm-Key wear
   hangssang.
always
   'Always wear the shoes so that your feet are warm.'
   (1200)

d. [ ___k ton-ul pel swu iss-key]
   money-Acc make way exist-Key
   meli-lulj yakkan ssymyen toyci.
   head-Acc a little use.if become
   'If you use your head a little so that you can make
   money, it is fine.' (1524)

e. *latido-lulj [ ___k khap khu-key] thul-e*
   radio-Acc very big-Key turn on-Comp
   nwa kaciikwu
   put because
   'Because he turned on the radio so that the sounds are
   very big....' (1663)

f. *os-ulj [ ___k chwup-key] ipumyen*
   clothing-Acc chilly-Key wear.if
   pyeng-i na-nun ke-ya.
   disease-Nom occur-Rel thing-Dec
'If you wear some clothing so that you feel chilly, then you get a disease.' (2682)

For instance, in (10f) it is very implausible to say that clothing feels chilly, since what feels chilly must be sentient. The understood subject of the resultative predicate *chwup-key* ‘chilly-key’ should be the person who wears the clothing.

Instead of object NPs, a nominative NP can explicitly appear in the result clause:

(11) a. *sinha-tul-to ecey-chelem ___j (chim-iₖ vassal-Plu-also yesterday-like saliva-Nom
    malu-key]/ chingchan-ul hay-ss-tapnita.*
    dry-Key compliment-Acc do-Pst-Dec
'Like yesterday, the vassals also complimented him so that their saliva got dried.' (490)

b. */yehayngca-tul-iₖ cham yehangha-l swu traveler-Pul-Nom truly travel-Rel way
    iss-key]/ ___j coh-key hay nwa-ss-telako.*
    exist-Key good-Key do put-Pst-Dec
'They made things good so that travelers can truly travel.' (2708)

In (11) the referents of the objects of the matrix clauses can be inferred from the utterance contexts, and a co-indexation is not involved in the sentences. Although it seems possible that the explicit nominative NP of a result clause is co-indexed with the understood object in the
matrix clause, such a sentence was not found in the Sejong Spoken Corpus.

3.4. Resultative constructions with two NPs

Two explicit NPs can simultaneously appear in a resultative sentence as shown in (12).

(12) [silkam\text{-}i_k na\text{-}key] soli\text{-}kkaci; ilehkey
feeling\text{-}Nom occur\text{-}Key sound\text{-}even like this
\text{sapiphay} kaciko
insert because
(lit.) ‘Because he even inserted the sound so that feeling occurs,...’ (2831)

In (12) the referents of the two NPs are not the same. But the two explicit NPs of a resultative sentence can refer to the same entity:

(13) yelum\text{-}ey cikum ca\text{-}l ttay\text{-}twu ilehkey
summer\text{-}in now sleep\text{-}Rel time\text{-}also like this
\text{pay\text{-}man;} teph\text{-}ko ca\text{-}canhayo
belly\text{-}only cover\text{-}and sleep\text{-}Dec
onto
temperature
\text{um}
\text{um}
The two explicit NPs in the clauses are co-indexed in (13) although the result clause comes after the matrix clause and the sentence has some parentheses.

In summary, the corpus data in this section suggest that the object of the matrix clause and the subject of the resultative predicate can optionally appear in a Korean transitive resultative sentence, and they are not necessarily co-indexed. Considering that these properties are consistent with typical pro-drop constructions, but not with object controls, we can say that what has been considered as predicative resultative constructions with X-key (which have an object control) actually contains a fully saturated result clause, and the subject of the clause can be dropped since Korean is a pro-drop language. In the sections that follow, we present further evidence for the pro-drop analysis of Korean resultative constructions with X-key.

4. Experiments

In this section we experimentally investigate the pro-drop analysis of resultative constructions with Adj/Verb-key.
4.1. Design of the experiments

The overview of the current experiment is provided in [Table 1].

<table>
<thead>
<tr>
<th># of target sentences</th>
<th>94</th>
</tr>
</thead>
<tbody>
<tr>
<td># of filler sentences</td>
<td>122</td>
</tr>
<tr>
<td># of control sentences</td>
<td>10</td>
</tr>
<tr>
<td># of dummy sentences</td>
<td>6</td>
</tr>
<tr>
<td># of participants?</td>
<td>264 in total (132 for each task)</td>
</tr>
<tr>
<td>Method</td>
<td>lab-based</td>
</tr>
<tr>
<td>Toolkit</td>
<td>OpenSesame (Mathôt et al. 2012) 5-point</td>
</tr>
<tr>
<td>Tasks</td>
<td>Likert Scale, binary Yes/No</td>
</tr>
</tbody>
</table>

The initial experimental results were all converted into a single data table for the statistical analysis using R (R core team 2017). The 5-point scale responses were Z-transformed for the ease and reliability of computation. In the current analysis, two types of plots were drawn out, including the density plot for the results obtained from the Likert Scale task (LS) and the stacked bar plot for the results from the binary Yes/No task (YN). The inferential statistics used in the current analysis include one-way ANOVA, paired T-test, and Fisher Yate’s Exact (FYE) test.

6) For more information about the experimental setting, see Song and Oh (2017) and Lee et al. (2018).

7) One of the reviewers pointed out that we needed to provide the background information of the participants, such as gender, major, age, etc. Nonetheless, Choe et al. (2017) reveal that the background variables do not affect acceptability judgments by much. Following the previous experimental finding, the background variables were not included in the table.
4.2. Results of the experiments: Adj(ective)–key

We discuss some experimental data here in relation to the hypothesis that Adj–key is the head of a fully saturated clause. The hypothesis predicts that the accusative object of the main clause and the nominative subject of X–key can optionally appear in a resultative sentence, and they are not necessarily co-indexed. However, the two NPs referring to the same entity (the dough) in (14) appear right next to each other, and the sentence sounds a bit awkward.8)

(14) 'Swuci-ka pancwuk-ul pancwuk-i napcakha-key twutulki-ess-ta.
     Swuci-Nom dough-Acc dough-Nom flat-Key pound-Pst-Dec
     ‘Swuci pounded the dough flat.’ (1301)

This may be taken as evidence against the claim that X–key heads a fully saturated clause: if the nominative NP pancwuk-i ‘dough–Nom’ is removed from the sentence, it is clearly acceptable. However, the awkwardness in (14) seems to be due to the redundancy of having the almost identical NPs in a short linear distance. If some adverbial expression appears in between the two NPs, thus increasing the linear distance between them, the sentence seems to sound better:

8) The numbers in parenthesis in (14) and the subsequent examples in this section are the indices of test items in the current experiment.
(15) a. Swuci-ka pancwuk-ul pancwuk-i
     Swuci-Nom dough-Acc dough-Nom
dapcakha-key twutulki-ess-ta.
     flat-key pound-Pst-Dec
'Swuci pounded the dough flat.' (1301)
b. Swuci-ka pancwuk-ul yelsimhi pancwuk-i
     Swuci-Nom dough-Acc diligently dough-Nom
dapcakha-key twutulki-ess-ta.
     flat-Key pound-Pst-Dec
'Swuci diligently pounded the dough flat.' (1302)
c. Swuci-ka pancwuk-ul yelsimhi
     Swuci-Nom dough-Acc diligently
chinkwu-wa hamkkey pancwuk-i
     friend-and together dough-Nom
dapcakha-key twutulki-ess-ta.
     flat-Key pound-Pst-Dec
'Swuci diligently pounded the dough flat with her
friend.' (1303)

The experimental results of the acceptability rates of the three
sentences in (15) are represented in <Figure 1>. Note that (a–c) in
<Figure 1> correspond to #1301 to #1303, respectively.
Both the ANOVA test (0.3029) and the FYE test ($p = 0.2952$) fail to reject the null hypothesis that the sentences in (15) are equally unacceptable. This implies that the three sentences do not significantly differ in acceptability from each other. Although the differences of the acceptability rates of the three sentences in (15) are not significant, we can see that the acceptability rate consistently increases as the distance between the two NPs increases. This is not conclusive evidence for the hypothesis, but the consistent increase seems to suggest that the two NPs are syntactically licensed, but the two NPs of the same referent tend not to appear right next to each other to avoid a redundancy.

Notably, if the “result clause” is preposed in a resultative sentence, the sentence sounds better, as shown in (16).

(16) a. ḲSwuci-ka pancwuk-ul pancwuk-i
   Swuci-Nom dough-Acc dough-Nom
   napcakha-key twutulki-ess-ta.
   flat-key pound-Pst-Dec
b. *pancwik-i napčakha-key Swuci-ka*
dough-Nom flat-Key Swuci-Nom
*pancwik-ul twutulki-ess-ta.*
dough-Acc pound-Pst-Dec

’Swuci pounded the dough flat.’ (1304)

The experimental results about the sentences in (16) are given in <Figure 2> below.

<Figure 2> Experimental results of #1301 vs. #1304

The hypothesis tests, including the T-test ($p = 0.4093$) and the FYE test ($p = 0.321$), indicate that the two sentences are not significantly different from each other in acceptability judgments. Nonetheless, this may also suggest that the acceptability rate increases when the two NPs of the same referent do not appear right next to each other. Based on the two experimental results, we temporarily assume that two NPs referring to the same entity can appear in a sentence simultaneously (see
also the naturally occurring sentence in (13) above, which has the two explicit NPs), but people tend to avoid a repetition of the same information in a short distance. Note that in (13) the result clause is “moved” to the end of the sentence, so the two NPs are separated from each other.

If this assumption is true, we predict that when the two NPs do not refer to the same entity, the sentence becomes better. This is borne out below:

(17) a. āSwuci-ka  pancwuk-ul  pancwuk-i
   Swuci-Nom  dough-Acc  dough-Nom
   napcakha-key  twutulki-ess-ta.
   flat-key     pound-Pst-Dec
   ‘Swuci pounded the dough flat.’ (1301)
b. āSwuci-ka  pancwuk-ul  kukes-i
   Swuci-Nom  dough-Acc  it-Nom
   napcakha-key  twutulki-ess-ta.
   flat-Key     pound-Pst-Dec
   ‘Suwci pounded the dough so that it became flat.’ (1402)
c. Swuci-ka  pancwuk-ul  pyomyen-i
   Swuci-Nom  dough-Acc  surface-Nom
   napcakha-key  twutulki-ess-ta.
   flat-Key     pound-Pst-Dec
   ‘Suwci pounded the dough until the surface was flat.’ (1401)
The experimental results are given in <Figure 3>. Note that the acceptability judgments on (17c) are much better than those on the others. The difference is also detected in the ANOVA test \((p = 0.0115)\) and the FYE test \((p = 3.728e-09)\).

<Figure 3> Experimental results of #1301, #1402, and #1401

The acceptability difference between (17a) and (17b) is not significant, since the pronoun *kukes* ‘it’ refers to the matrix object and does not add new information significantly than the matrix object (i.e., a repetition of the same information). By contrast, the acceptability difference between (17a) and (17c), or (17b) and (17c) is clearly significant: (17c) is much better than (17a) or (17b), since *pyomyen* ‘surface’ adds some new information about which part is affected by the pounding event. This is not a repetition of the same information.

Another prediction of the assumption is that if the two NPs contribute different information to a sentence, the sentence would become better. This is borne out in (18), the experimental results of which are presented in <Figure 4>. The results indicate that there is a
significant difference in acceptability judgments (ANOVA: \( p = 9.083 \times 10^{-5} \), FYE: \( p = 2.722 \times 10^{-5} \)).

(18) a. Swuci-ka pancwuk-ul pancwuk-i
Swuci-Nom dough-Acc dough-Nom
napcakha-key twutulki-ess-ta.
flat-key pound-Pst-Dec
‘Swuci pounded the dough flat.’ (1301)
b. Swuci-ka pancwuk-ul pancwuk ku cachey-ka
Swuci-Nom dough-Acc dough the itself-Nom
napcakha-key twutulki-ess-ta.
flat-Key pound-Pst-Dec
‘Suwci pounded the dough so that the dough itself became flat.’ (1403)
c. Swuci-ka pancwuk-ul pancwuk cenchey-ka
Swuci-Nom dough-Acc dough whole-Nom
napcakha-key twutulki-ess-ta.
flat-Key pound-Pst-Dec
‘Suwci pounded the dough so that the whole dough became flat.’ (1404)

<Figure 4> Experimental results of #1301, #1403, and #1404
The second NPs in (18a) and (18b) seem not to add new information, but the difference between them is that the second NP in (18b) seems to be emphasized. But in (18c) cenchey-ka ‘whole part–Nom’ adds information about exactly which part of the dough is affected (the whole dough, not only some part of it).

Furthermore, it is possible for the two NPs to refer to entirely different entities as in (19). The experimental results of these sentences are given in <Figure 5>.

(19) a. kunye-ka chelphan-ul son-i ttelli-key
    she-Nom metal-Acc hand-Nom shiver-Key
twutulki-ess-ta.
hammer-Pst-Dec
'Suwci pounded the metal so that her hands shivered.' (1410)
b. kunye-ka chelphan-ul on cipan-i
    she-Nom metal-Acc whole house-Nom
sikkulep-key twutulki-ess-ta.
noisy-Key hammer-Pst-Dec
'Suwci pounded the metal so that the whole house was noisy.' (1411)
c. wang-i khun khal-ul sinha-tul-i
    she-Nom big sword-Acc vassal-Plu-Nom
kep-ul mek-key huntul-e tay-ss-ta.
fear-Acc eat-Key swing-Comp keep-Pst-Dec
'The king kept swinging the big sword so that the vassals got scared.' (1414)
The high acceptability rates of the sentences in (19) can be accounted for by the avoidance of the redundancy: since the referents of the two NPs are different, there is no redundancy of the kind in (18a).

In summary, because of non-significant results about the linear distance between the two NPs (i.e., increasing the distance increases the acceptability, but not significantly), we had to assume that the two NPs can be basically licensed, but speakers tend to avoid a repetition of the same information in a short distance (i.e., avoidance of redundancy). However, this assumption is further supported by the significant experimental data: if the two NPs provide different information in a resultative sentence, the acceptability of the sentence significantly increases.

4.3. Results of the experiments: V(erb)–key

In the previous subsection, we have discussed the resultative constructions with Adj–key. In this subsection we examine the syntax of
resultative constructions with V-key and argue that V-key is parallel to Adj-key; i.e., V-key also heads a fully saturated clause (or a pro-dropped clause).

First, when the two NPs of the same referent in a resultative sentence with V-key appear right next to each other, the sentence sounds very awkward, as expected. For example, the sentence in (20) sounds a little redundant like the sentence with Adj-key in (18a) above.

(20) ɪˈku-ka Jane-ul Jane-i nemeci-key
     he-Nom Jane-Acc Jane-Nom fall-Key
     mil-ess-ta.
     push-Pst-Dec
     ‘He pushed Jane so that Jane fell.’ (1901)

This is not surprising given the avoidance of redundancy since the nominative NP Jane-i ‘Jane-Nom’ does not add information which is significantly different from what is provided by the matrix object Jane-ul ‘Jane-Acc’ and vice versa.

However, if some adverbial expression appears in between the two NPs, the sentence sounds better:

(21) a. ɪˈku-ka Jane-ul Jane-i nemeci-key
     he-Nom Jane-Acc Jane-Nom fall-Key
     mil-ess-ta.
     push-Pst-Dec
     ‘He pushed Jane so that Jane fell.’ (1901)
b. *ku-ka Jane-ul himkkes*
   he-Nom Jane-Acc with all her strength
   *Jane-i nemeci-key mil-ess-ta.*
   Jane-Nom fall-Key push-Pst-Dec
   ‘He pushed Jane with all his strength so that Jane fell.’
   (1902)

c. *ku-ka Jane-ul himkkes*
   he-Nom Jane-Acc with all her strength
   *kyeytan-eyse Jane-i nemeci-key mil-ess-ta.*
   stair-on Jane-Nom fall-Key push-Pst-Dec
   ‘He pushed Jane with all his strength on the stairs so that Jane fell.’
   (1904)

The experimental results of the sentences in (21) show that the participants judged the sentences in (21b) and (21c) as better than that in (21a) though the difference is marginal (ANOVA: $p = 0.02952$, FYE: $p = 0.02415$):
Like the sentences in (15) above, the acceptability differences in (21) are not significant, but the sentences get better when an adverbial expression appears in between the two NPs. This may suggest that the two NPs referring to the same referent can be basically licensed in a resultative sentence with V-key, but they just tend not to appear right next to each other in order to avoid a redundancy of the kind discussed above.

If the “result clause” is moved to the front of a resultative sentence with V-key as in (22b), the sentence sounds significantly better:

(22) a. ɪˈku-ka Jane-ul Jane-i nemeci-key
    he-Nom Jane-Acc Jane-Nom fall-Key
    mil-ess-ta.
    push-Pst-Dec
    ‘He pushed Jane so that Jane fell.’ (1901)
b. [Jane-i nemeci-key] ɪˈku-ka Jane-ul
    Jane-Nom fall-Key he-Nom Jane-Acc
    mil-ess-ta.
    push-Pst-Dec
    ‘He pushed Jane so that Jane fell.’ (1905)

The experimental results in <Figure 7> show that the “movement” of the result clause has a significant effect on the acceptability of the sentence. The two sentences are significantly differently judged (T-Test: $p = 3.376e-06$, FYE: $p = 0.000153$):
The significant difference of the acceptabilities between the sentences supports the claim that the two NPs of the same referent are basically licensed, but the linear distance between them in a sentence matters.

Furthermore, if some expressions appear between the two NPs of the sentence in (23a), the resulting sentences given in (23b) and (23c) sound better:

(23) a. \[\text{Jane-i nemeci-key} \] ku-ka \[\text{Jane-ul}\]
Jane-Nom fall-Key he-Nom Jane-Acc
mil-ess-ta.
push-Pst-Dec
‘He pushed Jane so that Jane fell.’ (1905)

b. \[\text{Jane-i nemeci-key} \] ku-ka
Jane-Nom fall-Key he-Nom
himkkes \[\text{Jane-ul mil-ess-ta}\.\]
with all his strength Jane-Acc push-Pst-Dec
‘He pushed Jane with all his strength so that Jane fell.’
c. [Jane-i nemeci-key] ku-ka himkkes
Jane-Nom fall-Key he-Nom with all his strength
kyeytan-eyse Jane-ul mil-ess-ta.
stair-on Jane-Acc push-Pst-Dec
‘He pushed Jane with all his strength on the stairs so that Jane fell.’ (1908)

The results of the experiments with the sentences in (23) are given in <Figure 8>.

<Figure 8> Experimental results of #1905, #1906, and #1908

Note that all the sentences in (23) are significantly better than the sentence in (22a). This suggests that the linear distance between the two NPs in a resultative sentence with V–key is an important factor.

In summary, regarding the pro-drop hypothesis, some experimental results are significant, but others are not significant though they point in the direction of the hypothesis. We believe these pieces of
experimental evidence together suggest that the two NPs can appear simultaneously in a $V$–key resultative sentence, but the two NPs of the same referent tend not to appear right next to each other to avoid some kind of redundancy.

5. Predictions of Clausal Analysis

In this section, we examine some predictions of the clausal analysis of Korean resultative constructions with $X$–key.

5.1. Semantic restrictions on resultative constructions

Predicative resultative constructions in English require certain result phrases, as shown in the following (Wechsler and Noh 2001:395, (9)).

(24) a. Sally painted the door red/a pale shade of red / *sticky / *beautiful / *noticeable.
   b. John hammered the metal flat / smooth / (?) shiny / into the ground / *beautiful / *safe.

The intransitive resultative constructions are also selective about the type of result phrases (Wechsler and Noh 2001:395, (10)):

(25) a. Robert ran clear of the fire / free of the car / to the store / *exhausted.
   b. John laughed silly / off his chair.
c. *We* yelled *hoarse*.

According to Wechsler and Noh (2001), this semantic restriction occurs since an argument is shared in the sentences. By contrast, the clausal resultative constructions do not have such a semantic restriction:

(26) a. John hammered the metal; consequently, the metal became *shiny*.
    b. John made the metal *safe* by hammering it.
    c. The ball rolled, thereby becoming *wet*.
    d. The gate rolled until it became *squeaky*.

This property seems to be due to the fact that clausal resultative constructions do not involve an argument-sharing; if the cause–effect relation is pragmatically plausible, any combination of clauses seems to be possible. Under the assumption that Korean clausal resultative construction is like English clausal resultative construction in terms of the semantic restriction about resultative predicates, we verify below the predictions of categorizing the typical "predicative resultative constructions" as a kind of clausal resultative construction.

5.2. Predictions on resultative predicates

First, if the resultative constructions with Adj–*key* are really clausal resultative constructions, they should allow various resultative phrases. Consider the following examples.
(27) a. Hank-ka ku soy-lul napcakha-key
Hank-Nom the metal-Acc flat-Key
twutulki-ess-ta.
hammer-Pst-Dec
‘Hank hammered the metal flat.’ (1601)
b. Hank-ka ku soy-lul yalp-key
Hank-Nom the metal-Acc thin-Key
twutulki-ess-ta.
hammer-Pst-Dec
(lit.) ‘Hank hammered the metal thin.’ (1605)

The two sentences are generally accepted as shown in the following experimental results:

<Figure 9> Experimental results of #1601 vs. #1605

Note that the English sentence “Hank hammered the metal thin” is normally unacceptable, but its corresponding Korean sentence in (27b) is pretty good like the typical resultative sentence in (27a). This suggests that Korean resultative constructions with Adj-key have less semantic
restriction.

Second, if the resultative sentences with V-key belong to the category of clausal resultative construction, the prediction is that they should allow various resultative phrases. The following sentences are all acceptable as presented in <Figure 10>.

he-Nom Yenghuy-Acc fall-Key push-Pst-Dec
'He pushed Yenghuy so that she fell.' (2001)

he-Nom Yenghuy-Acc pond-at fall into-Key push-Pst-Dec
'He pushed Yenghuy so that she fell into the pond.' (2004)

<Figure 10> Experimental results of #2001 vs. #2004

In short, the experimental data support the claim that what has been considered as predicative resultative construction in Korean is actually
clausal resultative construction, thus supporting the unified analysis of Korean resultative constructions with $X-key$.

5.3. Discussion

In order to investigate the syntactic structure of Korean resultative constructions with $X-key$, we have employed the two empirical methods used in linguistics, corpus and experiment. Needless to say, a theory of a phenomenon is built upon collected data. This means that we need to collect objective and thus reliable data in order to establish a proper theory of a linguistic phenomenon or to test the predictions of the theory. We believe that corpus and experiment are two objective methods in collecting linguistic data. This paper is differentiated from most other papers about Korean resultative constructions to the extent that both corpus and experiment have been used to obtain the objective data.

Even though the Sejong Spoken Corpus has relatively few Korean resultative constructions, we carefully examined and reported the corpus data in Section 3. We believe that the presented data are important since they are naturally occurring data, which are not biased by the authors. Moreover, they empirically supported the hypothesis that $X-key$ heads the fully saturated result clause in a resultative sentence.

However, because corpora do not include ungrammatical sentences in principle, it is not likely for us to have all the sentences discussed in a paper. In this regard, experiments can be useful to collect various kinds of data. We experimentally verified that some sentences, which sound
very awkward to the authors, are actually unacceptable to most participants. In addition, experimental data revealed variations of judgements among the participants. These variations also call for an account in any linguistic theory. We believe that the finding of such variations is another merit of experimental study.

6. Conclusion

In this paper we have presented both the corpus evidence and experimental data supporting the syntactic hypothesis in Lee(2016): what has been referred to as predicative resultative construction in Korean is actually a kind of clausal resultative construction. More specifically, the secondary predicate X−key heads a fully saturated result clause in a resultative sentence, and the nominative subject of X−key can be omitted since Korean allows pro-drop.

The claims advanced in this paper may not be conclusive due to the following limitations. First, corpus data are limited: only few resultative sentences were found in the Sejong Spoken Corpus. Secondly, although the trend was clear, some experimental results were marginally or not significant. Lastly, we did not discuss resultative sentences with X−tolok (instead of X−key). Despite of such limitations, we believe that the current study serves as a good starting point for the ultimate generalization that all the secondary predicates (including X−key and X−tolok) head a fully saturated clause in Korean. To this end, as a follow-up study, we are currently administering experiments with typical
“object control” constructions with $X$-tolok to show that they also involve a fully saturated clause rather than an object control just like the resultative sentences discussed in this paper.

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