

Korean causative change of state verbs: Non-culminating readings in HPSG

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1 Introduction

A subset of change of state (henceforth CoS) predicates in the perfective is able to produce contrasting readings between: (a) a non-culminating (hereafter NC) reading in which the result state specified by the meaning of the semantic core of the verb fails to obtain, and (b) a culminating reading in which the result state is always reached (cf. Tatevosov & Ivanov 2009; Demirdache & Martin 2015; Martin & Schäfer 2017; Fritz-Huechante et al. 2020, a.o.). Korean causative CoS predicates are also able to produce such readings (cf. Beavers & Lee 2020; Fritz-Huechante et al. 2020). One of the factors that allow NC readings is the agenthood properties of the external argument (Agent Control Hypothesis – ACH, cf. Demirdache & Martin 2015). Example (1) shows that in the presence of an agentive subject (represented by animacy in this study), a reading where the affected entity ‘the blanket’ is not in the state of being dry by the end of the event is possible as seen by the felicitous continuation of the *but*-clause in (1a), whereas negating the result state in the presence of an (inanimate) causer as in (1b) generates a contradiction (unless explicitly specified by a degree adverb or context, yielding a partial NC reading).

- (1) a. Yuli-ka ipwul-ul mal-ly-ess-ta. haciman ipwul-i malu-ci anh-ass-ta.
Yuri-NOM blanket-ACC dry-CAUS-PST-DECL but blanket-NOM dry-CONN NEG-PST-DECL
‘Yuri dried the blanket, but the blanket was not dry.’
- b. hayspyeth-i ipwul-ul mal-ly-ess-ta. #haciman ipwul-i malu-ci
sun-NOM blanket-ACC dry-CAUS-PST-DECL but blanket-NOM dry-CONN
anh-ass-ta.
NEG-PST-DECL
‘The sun dried the blanket, but the blanket was not dry.’

In this study, we focus on Korean causative CoS predicates, i.e. with verbs that possess a lexical scalar structure leaving aside verbs of consumption such as *mekkey hata* ‘cause to eat’ which scalar readings come from the incremental theme (cf. Beavers 2008). We expand the previous ideas (ACH – type of subject: agent vs. causer) regarding the factors that allow NC readings in simple sentence environments (i.e. excluding specific measurement phrases), considering: (a) the type of scalar structure, i.e. whether the predicate possesses a lower bound (e.g. *telephita* ‘to dirty’) or upper bound (e.g. *mallita* ‘to dry’), as well as (b) the type of causative structure, i.e. whether causation is formed by means of a morphological morpheme (e.g. *telep-hi-ta* ‘dirty-CAUS-DECL’) or by means of a periphrastic structure (e.g. *telep-key ha-ta* ‘dirty-KEY do-DECL’).¹ We investigate the impact of these three factors on NC readings in an experimental design. Results revealed that the type of subject (agent) had a significant effect on the acceptability of a NC reading, supporting the ACH. Further, the type of scalar structure (upper bound) had a significant effect with morphological causative predicates and not so with periphrastic causative predicates. We formalize our analysis in HPSG (Pollard & Sag 1994) in order to integrate the factors that allow for NC readings in Korean. We propose to model the different causative structures by means of lexical rules and an inheritance hierarchy of Korean causative CoS predicates. In order to model the subject type, we include the different theta-roles in the semantic representation of the predicates and we assume the scalar structure properties in the stem of the stative verb.

2 Factors allowing NC readings

As seen in Section 1, one of the factors that allows NC readings is the agenthood of the subject referent (ACH). In this study, we further inspect the scalar structure of Korean causative CoS predicates and propose that the identification of a standard degree of comparison in the semantic core of the verbs contributes to the availability of producing NC readings. In terms of scalar structure, CoS verbs have been analyzed w.r.t. the degree at which the result state in the affected argument manifests the property

¹Another factor that has shown to have an impact on NC readings is the perfective marker. This study does not include the analysis of these markers, however see Koenig & Muansuwan (2000) for an analysis of Thai, Koenig & Chief (2008) for Mandarin, and Martin (2020) for Mandarin and other languages.

of the semantic core of the verb, i.e. regarding the possibility to identify a standard degree of comparison or bound in a particular scale (cf. Hay et al. 1999; Kennedy & McNally 2005; Kennedy & Levin 2008). As such, CoS predicates have been classified as: (a) lower-bounded (e.g. *to dirty*), (b) upper-bounded (e.g. *to dry*), (c) open-bounded (e.g. *lengthen*), and (d) closed-bounded (e.g. *fill*) items. This classification is also pertinent in Korean. Focusing on upper-bounded (e.g. *mallita* ‘to dry’) and lower-bounded (e.g. *telephita* ‘to dirty’) predicates, we observe that NC readings are possible with the former but not with the latter. Example (1) is an instantiation of an upper-bounded predicate. The semantic core (*maluta* ‘dry’) of the causative verb *mallita* ‘to dry’ carries a standard degree of comparison that is maximally oriented. That is, in order for something to be dry, it has to be “totally dry”. Sentence (1) is naturally understood as ‘the blanket has dried to a maximum degree along the course of an event which was caused by Yuri / the sun’.² A NC reading arises with an agentive subject in (1a) but not in (1b) by interpreting the predicate as Yuri acted upon the blanket to dry it without necessarily causing the crucial CoS (i.e. the blanket being *completely* dry). In contrast, NC readings are not available with lower-bounded predicates (cf. (2)). For instance, the semantic core (*telepta* ‘dirty’) of *telephita* ‘to dirty’ possesses a minimum standard degree. Sentence (2) holds true at the presence of a minimal amount of dirt in the car caused by Sora / the rainstorm. Since there is a minimum change in ‘the car’ as soon as the subject referent acts upon it, only a culminating reading is possible irrespectively of the type of subject as seen by the contradiction of the *but*-clause in (2).

- (2) Sola-ka / pipalam-i catongcha-lul telep-hy-ess-ta. #haciman catongcha-ka
 Sora-NOM / rainstorm-NOM car-ACC dirty-CAUS-PST-DECL but car-NOM
 telew-eci-ci anh-ass-ta.
 dirty-INCH-CONN NEG-PST-DECL
 ‘Sora / The rainstorm dirtied the car, but the car was not dirty.’

Finally, we observe that the type of causative structure influences NC readings. Korean morphological causative CoS constructions (cf. (1a)) are formed by attaching the causative morpheme *-i* (or its allomorphs) to the stem of the stative verb (e.g. *mal-li-ta* ‘dry-CAUS-DECL’),³ whereas periphrastic causative CoS constructions (cf. (3)) are formed by adding the light verb *hata* ‘to do’ to the stative verb (e.g. *malu-key ha-ta* ‘dry-KEY do-DECL’) which forms a verbal complex structure setting the two verbs functioning together as one unit (cf. Lee 2007). Interestingly, with morphological causatives, the causing and the caused events overlap in terms of space and time, while with periphrastic causatives, the causing and caused events are able to form two separate events with different spatial and temporal parameters (cf. Choe 2022). These properties are what allows NC readings with morphological causatives and upper-bounded predicates as seen in (1a), in contrast to periphrastic causatives that allow NC readings indifferently from the type of scalar structure of the predicate as in (3).

- (3) Yuli-ka syechu-lul malu-key hay-ss-ta / telep-key hay-ss-ta. haciman syechu-ka
 Yuri-NOM shirt-ACC dry-KEY do-PST-DECL / dirty-KEY do-PST-DECL but shirt-NOM
 malu-ci anh-ass-ta / telew-eci-ci anh-ass-ta.
 dry-CONN NEG-PST-DECL / dirty-INCH-CONN NEG-PST-DECL
 ‘Yuri made the shirt dry / dirty, but the shirt was not dry / dirty.’

3 Testing NC readings

Following the discussion in Section 1 and 2, we developed a repeated observations design (1–5 Likert scale acceptability survey, where 1 = very bad and 5 = very good) in order to test the factors that allow NC readings in Korean. The study design was a 2x2x2: SUBJECT TYPE (agent vs. causer), SCALAR STRUCTURE (lower vs. upper), and CAUSATIVE STRUCTURE (morphological vs. periphrastic). The dependent variable was the acceptability of NC readings. Eight target items (4 lower-bounded and 4 upper-bounded verbs) and 24 fillers were embedded in the frame of the *but*-clause sentence as in examples (1), (2), and (3). Two lists (32 sentences per list) were created: morphological (e.g. *mallita* ‘to dry’) vs. periphrastic (e.g. *malukey hata* ‘make dry’) causatives and presented online on IBEX HU. Expectations were: (a)

²However, vagueness might interfere in identifying a maximum standard degree, see Hay et al. 1999; Solt 2015, a.o.

³We consider the intransitive verb *maluta* ‘dry’ and all the morphological basic CoS verbs in this study as stative. Among the semantic tests for their identification as stative is the acceptability of the imperative form that do not normally occur with states (cf. Dowty 1979). This is the case of *malu-* ‘dry’ as in **ipwul-ul malla-la!* ‘clothes-ACC dry-IMP’ vs. *ipwul-ul mal-ly-ela!* ‘clothes-ACC dry-CAUS-IMP’.

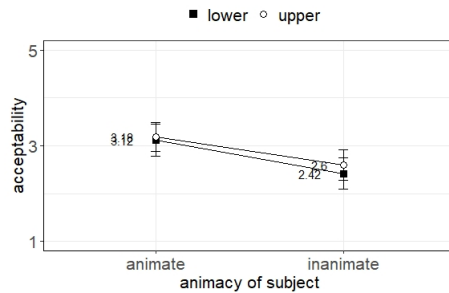
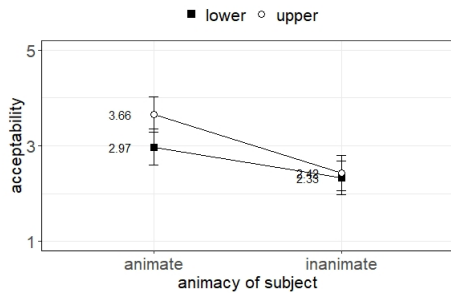


Figure 1: Acceptability NC readings morphological- Figure 2: Acceptability NC readings periphrastic
causatives (95% C.I.) causatives (95% C.I.)

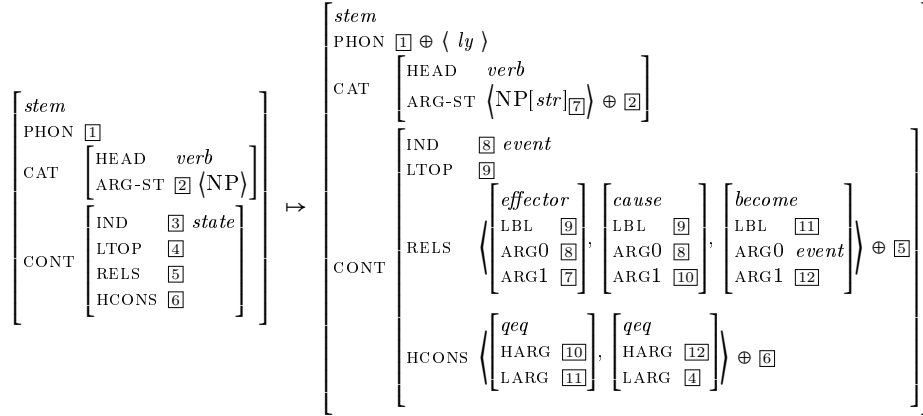
the factor SUBJECT TYPE has an impact on the acceptability of a sentence to the extent that agentive subjects would allow NC readings in contrast to (inanimate) causers, and (b) an interaction between the factor SCALAR STRUCTURE and CAUSATIVE STRUCTURE to the extent that NC readings are available for upper-bounded predicates in a morphological causative construction, whereas NC readings are available for both lower- and upper-bounded predicates in a periphrastic construction.

Thirty-two Korean native speakers living in South Korea participated in the surveys ($N = 16$ per list). One participant was excluded due to missing data points ($N = 31$, 15 female, 15 male, 1 no gender. Age: 22–42. $M = 29.90$). Fig. 1 for morphological causatives shows an interaction of the factors SUBJECT TYPE and SCALE STRUCTURE to the effect that the acceptability of NC readings is higher in the condition with upper-bounded items constructed with an agentive subject (mean 3.66). In the case of periphrastic causatives, Fig. 2 shows that this interaction is not present, i.e. both lower- and upper-bounded predicates behave similarly to the extent that the acceptability of NC readings is higher in the presence of an agentive subject (lower-bounded mean 3.11, upper-bounded mean 3.18) than with a causer. The data was fitted with a linear mixed effects model, based on a maximal random-effects model (cf. Barr et al. 2013). The random effects structure contained intercepts for ITEMS (different verbs) and PARTICIPANTS. Results showed a significant effect of SUBJECT TYPE ($p < .001$), SCALE STRUCTURE ($p = .02$), a significant interaction of CAUSATIVE STRUCTURE \wedge SCALE STRUCTURE ($p < .001$), and a marginal interaction of CAUSATIVE STRUCTURE \wedge SCALE STRUCTURE \wedge SUBJECT TYPE ($p = .07$).

4 HPSG analysis

We propose the lexical rule for morphological causatives as in (4) (cf. Müller 2002; Müller 2018). The analysis uses Minimal Recursion Semantics (Copestake et al. 2005). We assume a Neo-Davidsonian decomposition approach using an *effector* relation (Van Valin & Wilkins 1996) to describe the semantic roles and a *cause* and a *become* relation as it was suggested by Dowty (1979: Section 5.6) and Egg (1999). In (4), the highest event of the semantic representation in the output of the rule is the *cause* event [8], represented as value of ARG0 of the *cause* relation. The LTOP of the AVM at the right-hand side of the lexical rule also points to the *cause* relation. The argument under ARG1 [10] is *geq* with the *become* predicate. The *become* relation scopes over the state contributed by the input verb at the left-hand side of the lexical rule. This state has the LTOP [4] and the argument of *become* ([12]) outscopes [4]. The subject [7] is the effector of the *cause* event. Label and event variable of the *cause* and the *effector* relation are identified as is common for intersective modifiers in MRS. The RELS list of the input, which contains the relations of the state ([5]) is appended to the RELS list of the output of the LR. The same is true for the handle constraints of the input ([6]).

- (4) Lexical rule for morphological causatives:



(5a) shows the semantic representation in a more readable format. This representation can be used for the cases discussed above, since *effector* has two subtypes: *agent* and *cause-n* (we use *cause-n* with the -n suffix to distinguish it from the other *cause* relation). Also the degree to which a state is reached is not represented in (5a). (5a) is an underspecified representation and can stand for (5b) and (5c). x and y are the indices of the involved NPs, e_1 and e_2 are event variables for the cause and the become event and s the variable for the state.

- (5) a. $\text{effector}(e_1, x) \wedge \text{cause}(e_1, \text{become}(e_2, \text{dry}(s, y)))$ general pattern
b. $\text{agent}(e_1, x) \wedge \text{cause}(e_1, \text{become}(e_2, \text{dry}(s, y)))$ dry_{\min} or dry_{\max} or between
c. $\text{effector}(e_1, x) \wedge \text{cause}(e_1, \text{become}(e_2, \text{dirty}_{\text{final}}(s, y)))$ effector could be agent or cause-n

The lexical rule is given in the usual format with left-hand side and right-hand side for readability, but we assume a representation in the mother-daughter format suggested by Briscoe & Copestake (1999) and Meurers (2001). This format allows to type lexical rules and we assume that the lexical rule in (4) has the type *morphological-cos-lr*. See below for more information on the type hierarchy.

In the case of the periphrastic causatives, we propose the lexical entry for the predicate *ha-* ‘do’ as in (7) (cf. Müller 2002; Müller 2013). We assume argument composition of the type suggested by Hinrichs & Nakazawa (1994) and Müller (2002). An alternative suggestion was made by Kim (2016) for Korean: Kim suggests like Van Eynde (2019: 1044) to do the argument composition in the complex formation schema. We prefer the lexical approach to argument attraction since it extends to German and in particular to complex cases of the so-called remote passive. The predicate *ha-* ‘do’ combines with the dependent verbal element with the connective marker *-key*. We assume that the predicate *ha-* functions as the head of the complex predicate. The argument $\boxed{1}$ is triggered by the complex predicate *-key hata* ‘make’ and the argument $\boxed{2}$ is raised from the SUBJ list of the embedded verb to be the object of the complex predicate (cf. Hinrichs & Nakazawa 1989). The other arguments (COMPS) are raised as well. Importantly, the causing and the caused events are able to produce independent readings in periphrastic causative constructions (cf. Section 2) due to the presence of the predicate *ha-* ‘do’. Therefore, we include the ‘doing’ event in the semantic representation as in (6b): *dry* is embedded under the ‘do’ event which gives the reading that the change of state does not necessarily holds. ‘Do’ is able to scope over cause, and since it is possible for cause and become to be dropped, ‘do’ can have scope over the state *dry* directly.

- (6) a. $\text{effector}(e_1, x) \wedge \text{cause}(e_1, \text{become}(e_2, \text{dry}(s, y)))$ [The wind/Peter dried the clothes.]
b. $\text{agent}(e_1, x) \wedge \text{do}(e_1, \text{dry}(s, y))$ [Peter dried the clothes but failed.]

The semantic representation in (6) is parallel to what we saw with morphological causatives, the exception being the *do* relation. The requirement of the embedded verbs is to have an INDEX value of type *state* which excludes non-stative verbs. (7) shows how this is encoded in MRS:

- (7) Lexical entry for periphrastic causatives:

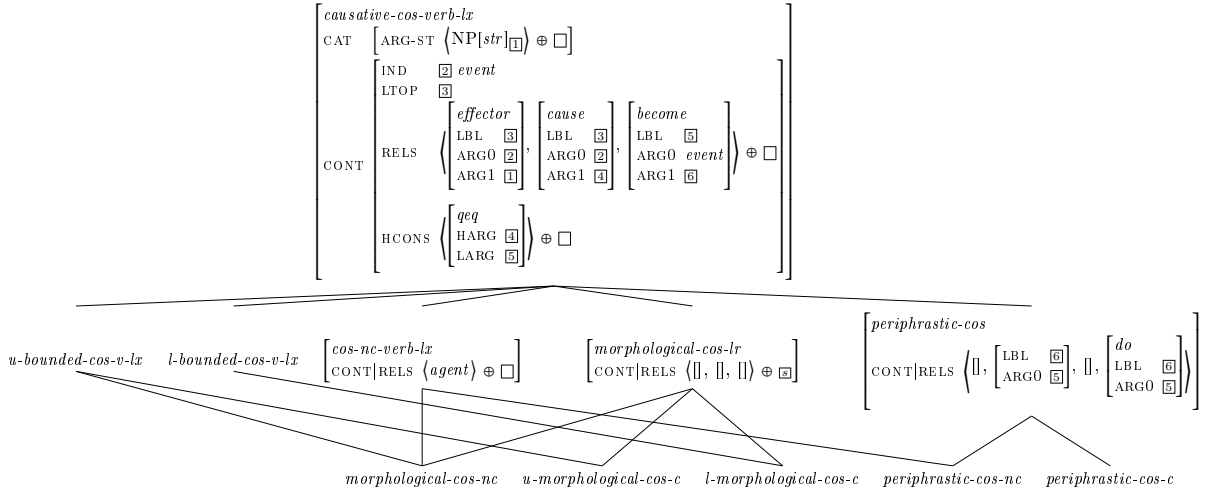
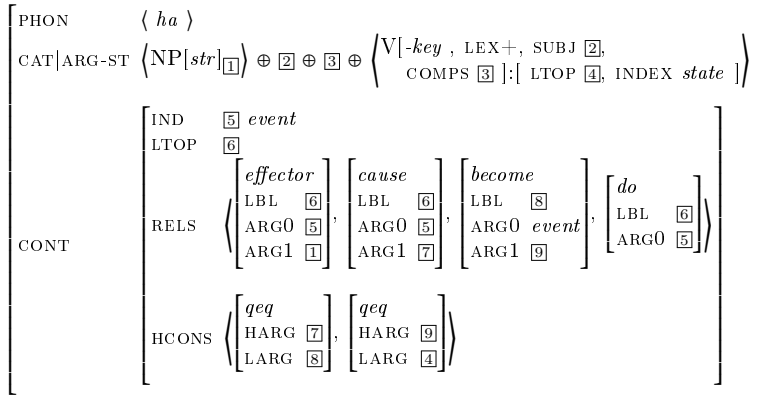


Figure 3: Type hierarchy for Korean causative CoS predicates



The *do* relation is treated like an adjunct: it shares the label and the event with the cause and the *effector* relation. The relations of the embedded verb are not appended to the RELS list, since this will be done in the semantic combination when *ha* is combined with the embedded verb. However, the scope relation is established in the lexical item: [9] is *qeq* to the LTOP of the embedded verb ([4]).

Figure 3 shows the different types of Korean causative CoS constructions. There are types for morphological CoS predicates (formed by the lexical rule) and periphrastic ones. Both inherit from a general CoS lexeme type. The morphological-cos-lr establishes the linking to the state of the input verb (not shown) and the periphrastic-cos to the embedded verb (not shown either due to space limitations). We then have types for lower-bounded-cos-verb-lexemes and for upper-bounded-cos-verb-lexemes. The constraints for these types will be provided in the full paper. The leaf nodes of the hierarchy are *morpho-CoS.N(on)C(ulmination)*, *l-morpho-CoS.C(ulmination)*, *u-morpho-CoS.C(ulmination)*, *peri-CoS.NC* and *peri-CoS.C*. All nc verbs have to have an agent (cf. Sections 1 and 2). We therefore capture this at the type *cos-nc-verb-lexeme*. Types that do not inherit from this type have the general *effector* relation, which can be both an agent or a non-animate causer. Periphrastic CoS predicates can be either upper-bounded or lower-bounded or both, which is captured by not adding any constraints in the hierarchy. For the morphological CoS predicates we distinguish respective subtypes. Based on the test findings, we argue that the predicate *ha*- ‘do’ has a significant effect on the semantic representation of the periphrastic causative CoS predicates allowing NC readings independently of the type of scalar structure that the verb possesses. In contrast, the factors scalar structure and subject type have an effect on NC readings with morphological causative CoS predicates.

5 Conclusion

In this study, we have investigated the different factors allowing NC readings with Korean causative CoS predicates. In an experimental design, we confirmed that in this language, not only the agenthood of the subject (ACH) has an impact on NC readings, but also the type of scale structure and the type of

causative structure to the extent that upper-bounded predicates in the presence of an agentive subject allow for NC readings in morphological causative constructions and not so with lower-bounded predicates. In contrast, the periphrastic causative structure *-key hata* ‘make’ has an effect on NC readings to the extent that it discards the scale structure of the predicates as a factor for such readings, i.e. *hata* ‘do’ takes any stative verb and produces a reading that describes the action that might cause a CoS in the affected entity. We account for these findings in HPSG by means of an inheritance hierarchy of Korean causative CoS predicates. Further, in order to describe the NC readings, we made use of the semantic representation of the predicates, including not only syntactic but also semantic information to better explain NC readings.

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