Intentionality, Scalar Change, and Non-culmination in Korean Caused Change-of-State Predicates

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Abstract

This paper investigates the interpretations of caused change-of-state predicates in Korean, and in particular non-culmination readings in which the result state inherent to the meaning of the predicate fails to obtain either fully (zero result) or partially. We argue that zero result readings require that the subject intended the coming about of the result state, while readings in which some result obtains (partially or completely) lack this entailment. Yet zero result interpretations are not reducible to 'try'-constructions since the former but not the latter require the direct causation. Furthermore, zero result readings arise only in active voice, a grammatical constraint not explicitly discussed for other languages. We argue that the full suite of possible readings arises from two factors: a sublexical modality over worlds conforming to the agent’s intentions for zero result readings that arises from a special active voice inflection in Korean and a scalar semantics for change-of-state verbs that derives partial result readings as a type of degree achievement interpretation. An interaction of these two factors produce the range of possible readings for Korean change-of-state predicates. Finally, we discuss our account in relation to the Agent Control Hypothesis of Demirdache and Martin (2015) that agenticity properties of the subject are necessary for certain non-culmination readings, and suggest that Korean exemplifies the ACH provided that what counts as “control” includes intentionality.

1 Introduction

Non-culmination is an increasingly well studied phenomenon in a variety of languages, whereby a predicate that in principle would be classified as a caused change-of-state predicate allows an interpretation in which the final result state named by the predicate is not entailed to obtain (e.g. Japanese in Ikegami 1985; Hindi in Singh 1998; Arunachalam and Kothari 2011; Thai in Koenig and Muansuwan 2000; Salish languages in Bar-el et al. 2005; Chinese in Koenig and Chief 2008; see Demirdache and Martin 2015 and Koenig et al. 2016 for cross-linguistic summaries). A reading such as this is illustrated for Karachay-Balkar (Turkic; spoken in the Caucasus), where the predicate meaning ‘open the door’ in (1) does not entail that the door actually became open, evidenced by the fact that a continuation explicitly canceling the result state is non-contradictory.

(1)  
kerim eˇ sik-ni ac-xan-di, alaj boˇ sa-ma-ˇvan-di.  
Kerim door-ACC open-PFV-3SG but  finish-NEG-PFV-3SG  
(lit.) ‘Kerim opened the door, but did not finish.’  
(Tatevosov 2008: 396, (9))
This is of course different from a language like English, where by and large caused change-of-state predicates entail that the result state obtains; cancelation of the state generates a contradiction:

(2) \#John (just) opened the door, but it is not open.

The existence of non-culmination readings raises a number of questions about the nature of lexical meaning and event construal, including what the underlying event structure is for non-culminating caused change-of-state predicates, how that differs from equivalent predicates that do entail culmination, and what conditions or contexts give rise to non-culmination readings.

In this paper we discuss non-culmination readings for caused change-of-state predicates in Korean. While typically the relevant result state obtains, as in Karachay-Balkar this is not strictly necessary in Korean (see also Park 1993; Y-S. Lee 2004; J. Lee 2012, 2014, 2015, 2016a,b; Martin 2016), as in the following where explicit denial of a result is non-contradictory:

(3) ku-ka changmwun-ul kkay-ss-ta. haciman changmwn-i kkay-ci-ci
    he-NOM window-ACC break-PST-DECL but window-NOM break-PASS-COMP
    anh-ass-ta.
    NEG-PST-DECL
    (lit.) ‘He broke the window. But it was not broken.’

However, this reading is not freely available. In particular, in Korean certain non-culmination readings require subject intentionality regarding the coming about of the result state, and (3) is such a case (for similar observations on other languages see Ikegami 1985; Tsujimura 2003; Tatevosov 2008; Tatevosov and Ivanov 2009; Martin and Schäfer 2017, 2012; Martin 2016; inter alia). These non-culmination readings are similar to constructions meaning “try to P”, though we show for Korean that “try to P” constructions are acceptable in a strictly wider set of contexts. Although intentions have been argued not to be necessary for deriving non-culmination in some other languages (see e.g. Martin and Schäfer 2012 on French and German), in Korean they are, suggesting language-specific variation in what semantic factors give rise to it. In addition there are specific grammatical constraints that further limit the contexts in which these non-culmination readings arise: the relevant intentions must be those of the grammatical subject – again more limited than in French and German – and the readings only arise in active voice variants of such predicates, something we are unaware of having been explicitly claimed for other languages (though see Paul et al. 2016). These facts suggest further sources of variation across languages.

We propose an analysis of Korean non-culmination that involves two key ingredients. The first is a (sublexical) modality à la Koenig and Muansuwan (2000), Bar-el et al. (2005), Tatevosov (2008), and Martin and Schäfer (2012, 2017) (see also Dowty 1979; Beavers 2011a), whereby the result obtains in some possible world and not the real world, albeit with a modal base defining the subject’s intentions, building on Inman (1993), Koenig and Davis (2001), Beavers and Zubair

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\[3\] We note that there is speaker-to-speaker variation in which verbs allow non-culmination and how easy it is to get it, e.g. some speakers who accept yel- ‘open’ on a non-culmination reading may not as easily accept kkay- ‘break’. There are several potential reasons why this might be. For example, as we discuss below, some types of non-culmination readings are generally ruled out for certain aspectual subtypes of change-of-state predicates. But aspectual coercion may give rise to such readings, and speakers may differ in how much they tolerate aspectual coercion. In other cases differences in lexicalization of individual lexical items may rule in or out certain readings, on a purely idiosyncratic verb-to-verb basis or possibly subject to preferences for certain subclasses of change-of-state predicates to favor or disfavor such readings. However, our goal is to explain the nature of these readings when they do arise and not give a detailed analysis of speaker-to-speaker variation, something that we leave for future work.
(2010), and Grano (2016, 2017). The modality is introduced by active voice inflection, explaining its sharp grammatical limits. Second is a scalar analysis of change, building on Hay et al. (1999), Kennedy and Levin (2008), Koenig and Chief (2008), and Beavers (2011b, 2013), that derives culmination readings and certain other non-intentional non-culmination readings and interacts with the modality to predict a range of possible readings for caused change-of-state predicates. Overall, our analysis thus combines insights from different prior analyses of non-culmination in other languages (see Demirdache and Martin 2015: 190–192), albeit within a single language and suggesting previously unattested parametric variation in the type of modality needed to model non-culmination and what kinds of lexical and grammatical constraints figure into when such readings arise. Finally, we examine our proposal in light of the Agent Control Hypothesis of Demirdache and Martin (2015), which claims that certain non-culmination readings require agentivity properties of the subject not necessarily present on culmination readings. We suggest that Korean exemplifies this proposal, provided that what counts as “control” includes intentionality.

We first describe the relevant readings in Section 2, and motivate the intentionality condition in Section 3. In Section 4 we discuss further constraints on non-culmination readings, comparing them semantically to Korean “try to P” constructions and also consider grammatical constraints on their acceptability. In Section 5 we motivate the formal ingredients necessary for our analysis, honing in on scalar semantics and sublexical modality, and outline our analysis and its predictions. We conclude in Section 6 with a discussion of points of cross-linguistic variation in non-culmination.

2 Defining culminating and non-culminating readings

We begin by defining the relevant possible readings of Korean caused change-of-state predicates. Before we continue we offer one terminological clarification. The terms “accomplishment” and “achievement” are sometimes used in an event structural sense to distinguish predicates that describe a caused change-of-state (e.g. John broke the vase) vs. a change-of-state that does not necessarily involve causation (e.g. The vase broke), respectively (see e.g. Dowty 1979: 91–99; Rappaport Hovav and Levin 1998: 108). However, the terms also have a temporal use where an “accomplishment predicate” describes a durative change-of-state and an “achievement predicate” a punctual change-of-state, in both cases regardless of whether it was caused (following Vendler 1957; see e.g. the classification in Beavers 2013: 692, inter alia). Since the durative vs. punctual distinction will be relevant in delimiting what types of non-culmination are possible for a given predicate, we reserve the terms “accomplishment” and “achievement” for their temporal uses, and use the terms “caused change-of-state” and “inchoative” to describe predicates in terms of their event structures.

Turning now to non-culmination, the default interpretation of a Korean caused change-of-state predicate is that a result is implied to have obtained. However, that this is not entailed can be demonstrated by the fact that it is non-contradictory to go on to deny that any result obtained:

(4) a. ku-ka changmwun-ul yel-ess-ta. haciman changmwun-i yel-li-ci
   he-NOM window-ACC open-PST-DECL but window-NOM open-PASS-COMP
   anh-ass-ta.
   NEG-PST-DECL
   (lit.) ‘He opened the window. But it was not opened.’

   b. ku-ka changmwun-ul tat-ass-ta. kulena changmwun-i tat-hi-ci
   he-NOM window-ACC close-PST-DECL but window-NOM close-PASS-COMP
anh-ass-ta.
NEG-PST-DECL
(lit.) ‘He closed the window. But the window was not closed.’

c. na-nun pwul-ul khi-ess-ta. kulena pwul-i khi-e ci-ci
I-TOP light-ACC turn_on-PST-DECL but light-NOM turn_on-COMP PASS-COMP
anh-ass-ta.
NEG-PST-DECL
(lit.) ‘I turned on the light. But the light was not turned on.’

d. na-nun pwul-ul kke-ss-ta. kulena pwul-i kke ci-ci
I-TOP light-ACC turn_off-PST-DECL but light-NOM turn_off-COMP PASS-COMP
anh-ass-ta.
NEG-PST-DECL
(lit.) ‘I turned off the light. But the light was not turned off.’

Such examples are not reserved to artificial contexts; they are also found naturally occurring:

   mouth-ACC open-PST-but at_all open-PASS-COMP-ACC NEG-PST-DECL
   (lit.) ‘.....He opened the mouth, but it was not opened at all.’
   (https://books.google.co.kr/books?id=sUKxAgAAQBAJ\&redir)
   he-ACC burn-CAUS-PST-but he-TOP burn-COMP NEG-PST-DECL
   (lit.) ‘.....They burned him, but he did not burn.’
   (http://budnlife.com/view.htm?origin_id=60)
c. khathulinnu-ka ku-lul huntule kkay-wu-ess-ciman ku-nun kkay-ci
   Catherine-NOM he-ACC shaking wake-CAUS-PST-but he-TOP wake-COMP
anh-ass-ta.
NEG-PST-DECL
   (lit.) ‘Catherine woke him by shaking him, but he did not wake.’
   (https://books.google.co.kr/books?id=6NAAwoAAQBAJ\&pg)

Furthermore, as in other languages, there are at least two types of readings called “non-culmination” with causative verbs, which we label “zero result” and “partial result” (modifying the terminology of Demirdache and Martin (2015: 194); see also Tatevosov 2008: 395 on “failed attempt” and “partial success”). On the first no result obtains at all; (3)-(5) illustrate this. On the second some change obtains, albeit it is not “complete”, i.e. it obtains to some less than full degree or for only part of the patient, as in (6), where any amount of change may be sufficient to make the predicate felicitous.

(6) ku-ka changmwun-ul yel-ess-ta. kulayse changmwun-i cokum
   he-NOM window-ACC open-PST-DECL so window-NOM a_little
   yel-li-ess-ta.
   open-PASS-PST-DECL
   ‘He opened the window. So it was opened a little bit.’
Taken together, the simplest analysis might just be that Korean caused change-of-state predicates are vague regarding the inference of result and it arises (in complete or partial result) by conversational implicature (see e.g. Bar-el et al. 2005: 94–97 on the Salish languages St’át’imcets and Skwxwu7mesh). Additional evidence for this might be that it is possible to explicitly reinforce that the result state did in fact obtain, as opposed to English, where explicit reinforcement sounds redundant, consistent with the result inference in English arising by entailment:

\[(7) \text{ ku-ka } \text{ changmwun-ul yel-ess-ta. } \text{ kulayse changmwun-i yel-li-ess-ta.}\]

He opened the window. So the window was opened.’

However, in the next two sections we argue that this is not the case. Rather, zero result readings are distinct from partial result and culmination in further properties which suggest they are derived in a wholly separate way, also giving us insight into the factors that license such readings in general.

3 Intentionality in zero result interpretations

We now demonstrate that zero result readings require intentionality of the subject, while partial result and culmination readings do not. This means first and foremost that there are limits on when zero result readings arise, and additionally that treating partial result as a type of non-culmination (as suggested by Tatevosov 2008) rather than as a type of culmination is not the right classification. These data further suggest that zero result readings do not arise by implicature but from a systematic ambiguity for caused change-of-state predicates. We also discuss an apparent exception to the intentionality constraint that involves imperfect knowledge by the agent about the event.

3.1 Evidence from adverbial modification

The first argument that intentionality is required on zero result readings comes from the fact that when the result is known not to obtain (e.g. it is explicitly denied) modifiers like uytohacianhkey ‘unintentionally’, silswulo ‘by mistake’, and wuyenhi ‘accidentally’ are unacceptable (see e.g. Grano 2017: 596–597 on such modifiers in diagnosing intention).

\[(8) \text{ a. ku-ka (#uytohacianhkey/#silswulo/#wuyenhi) changmwun-ul kkay-ss-ta.}\]

He broke the window (unintentionally/by mistake/accidentally). But the window was not broken.’

\[\text{ b. ku-ka (#uytohacianhkey/#silswulo/#wuyenhi) changmwun-ul yel-ess-ta.}\]

He opened the window (unintentionally/by mistake/accidentally). But the window was not opened.’

Conversely, uytocelku ‘intentionally’ and ilpwule ‘on purpose’ are relatively more acceptable, although they do carry a certain redundancy, suggesting that intentionality is already implied:
(9) a. **ku-ka (uytocekulo/?ilpwule) changmwun-ul kkay-ss-ta. ku-kena**
he-NOM intentionally/on purpose window-ACC break-PST-DECL but
**changmwun-i kkay-ci-ci anh-ass-ta.**
window-NOM break-PASS-COMP NEG-PST-DECL
(lit.) ‘He broke the window (intentionally/on purpose). But the window was not broken.’

b. **ku-ka (uytocekulo/?ilpwule) changmwun-ul yel-ess-ta. ku-kena**
he-NOM intentionally/on purpose window-ACC open-PST-DECL but
**changmwun-i yel-li-ci anh-ass-ta.**
window-NOM open-PASS-COMP NEG-PST-DECL
(lit.) ‘He opened the window (intentionally/on purpose), but the window was not opened.’

Acceptable contexts for culmination and partial result readings are different – in these cases, when context clearly establishes that a result obtains either completely or partially, adverbs indicating either intentionality or non-intentionality are equally acceptable:

(10) a. **ku-ka uytohacianhkey/silswulo/wuyenhi/uytocekulo/ilpwule chayk-ul**
tear-PST-DECL so book-NOM a little/completely tear-PASS-PST-DECL
‘He tore the book unintentionally/by mistake/accidentally/intentionally/on purpose. So the book was a little/completely torn.’

b. **ku-ka uytohacianhkey/silswulo/wuyenhi/uytocekulo/ilpwule**
he-NOM unintentionally/by mistake/accidentally/intentionally/on purpose
**changmwun-ul yel-ess-ta. ku-ayse changmwun-i cokum/wancenhi**
window-ACC open-PST-DECL so window-NOM a little/completely
**yel-li-ess-ta.**
open-PASS-PST-DECL
‘He opened the window unintentionally/by mistake/accidentally/intentionally/on purpose. So the window was a little/completely opened.’

Taken together, these data suggest that zero result readings necessitate intentionality on the part of the subject, but this is not a requirement for partial result or culmination.

### 3.2 Evidence from explicitly intentional constructions

We now show that the putative intentionality found in zero result readings is essentially the same as entailed by the construction *P uyto-ka iss*- ‘P intention-NOM exist’ “have an intention to P”, where *P* represents a caused change-of-state predicate. In particular, we show that both zero result and *P uyto-ka iss*- give rise to similar inferences regarding the agent’s expectations and understanding of the caused change-of-state, drawing on Searle (1983), Bratman (1987), Farkas (1988), Anscombe (2000), Sinhababu (2009, 2013), and Grano (2016, 2017). Note that we do not take the inferences we discuss here to be definitional of intentions; we simply use these as diagnostics for demonstrating a similarity between the two types of predicates. We first outline some basic semantic properties of *P uyto-ka iss*- and then show that zero result readings show the same properties.

First, *P uyto-ka iss*- entails that the agent desires that the result state of *P* actually obtain (building on Searle 1983: 3 and Sinhababu 2013: 1–2); explicitly denying this is contradictory:
This is quite similar to Grano (2017), who analyzes intentions as entailed by the English verb *intend* as a subtype of wanting restricted to the preferences an agent has when it comes to deciding on what actions to take (building on the “effective preferences” of Condoravdi and Lauer 2016: 24–37). One caveat, though, is that the agent may have conflicting desires about whether he wishes for a particular state to obtain. For example, for (11a) if someone has a gun to the agent’s head and insists he kill Tom lest he himself be shot, the agent may be defiant and flatly refuse. In this case the first clause in (11a) is simply not true (but the continuation is). However, there is also the possibility that the agent may generally desire Tom to live (a “mere desire” qua psychological fact as per Condoravdi and Lauer), but under the given circumstances ranks saving his own life more highly and is willing to – and thus wants to, in the effective preference sense – kill Tom to achieve this. In this case the full discourse in (11a) could be read as felicitous, but it is key that the agent is caught between conflicting desires, a mere desire which satisfies the second clause and an effective preference which crucially does not. The reading that is ruled out is if the agent somehow intends to kill Tom but has absolutely no desire for Tom’s death, i.e. that (11a) is acceptable in the absence of conflicting desires. (Similar contexts can be constructed for (11b).) This suggests that the existence of an (effective) desire for the result is required for *uyto-ka iss-* constructions.

Second, *P uyto-ka iss-* entails that the agent believes some causing eventuality (e.g. one explicitly given) will produce the result (see again Searle 1983: 3 and Sinhababu 2013: 1–2). Explicitly denying this is contradictory:

(12) a. *ku-nun Tom-ul tok-ulo cwuk-i-l uyto-ka iss-ess-ta.* #kulena *ku-nun*

he-TOP Tom-ACC poison-INS dead-CAUS-REL intention-NOM exist-PST-DECL but he-TOP


Tom-NOM dead-NMZL-ACC want-COMP NEG-PST-DECL

(lit.) ‘He intended to kill Tom with poison. But he didn’t know the poison could kill Tom.’

b. *ku-nun Tom-ul pascwul-lo cap-ul uyto-ka iss-ess-ta.* #kulena

he-TOP Tom-ACC rope-INS catch-REL intention-NOM exist-PST-DECL but

*ku-nun pascwul-lo Tom-ul cap-ul swu iss-ta-nun kes-ul*

he-TOP rope-INS Tom-ACC catch-REL way exist-DECL-REL thing-ACC mol-lass-ta.

(not know-PST-DECL)
He intended to catch Tom with rope. But he didn’t know he could catch Tom with a rope.

It does not matter whether the cause can derive the result, just that the agent believes it will. Note that we are only claiming that the agent believes the cause could bring about the result, presumably one of the “flat-out beliefs” Bratman (1987: 36–37) claims serve as background for planning. We are not claiming that the agent believes that he actually will bring about the result, which Bratman (1987: 36–41) suggests is not part of intention (see also Grano 2017: 625–626).

Finally, P uyto-ka iss- constructions entail an intention to perform some causing eventuality (building on Searle 1983: 80; Sinhababu 2013: 3; Jackendoff and Culicover 2003: 537, Grano 2016: 216–217; Grano 2017: 609–616, the latter building on the RESP(onsibility)-relation of Farkas 1988: 35–40). Explicitly denying this is contradictory:

\[
(13) \begin{align*}
\text{a. } & \text{ ku-nun Tom-ul cwuk-i-l uyto-ka iss-ess-ta.} \quad \#\text{kulena ku-nun} \\
& \text{ he-TOP Tom-ACC dead-CAUS-REL intention-NOM exist-PST-DECL} \quad \text{but he-TOP} \\
& \text{ Tom-ACC cwuk-i-l pangpep-ul silhayngha-l uyto-nun} \\
& \text{ Tom-ACC dead-CAUS-REL method-ACC carrying-out-REL intention-TOP} \\
& \text{ eps-ess-ta.} \\
& \text{ not_exist-PST-DECL}
\end{align*}
\]

(lit.) ‘He intended to kill Tom. But he did not intend to do anything to kill Tom.’

\[
\begin{align*}
\text{b. } & \text{ ku-nun Tom-ul cap-ul uyto-ka iss-ess-ta.} \quad \#\text{kulena ku-nun} \\
& \text{ he-TOP Tom-ACC catch-REL intention-NOM exist-PST-DECL} \quad \text{but he-TOP} \\
& \text{ Tom-ACC cap-ul pangpep-ul silhayngha-l uyto-nun} \\
& \text{ Tom-ACC catch-REL method-ACC carrying-out-REL intention-TOP} \\
& \text{ eps-ess-ta.} \\
& \text{ not_exist-PST-DECL}
\end{align*}
\]

(lit.) ‘He intended to catch Tom. But he did not intend to do anything to catch Tom.’

In this case there is a potential problem of infinite regress, since intentions regarding the larger event involve intentions regarding one of its subevents. However, the larger event and the subevent are not of the same type – the former is a caused change-of-state and the subevent an action (or disposition; Beavers and Zubair 2013: 32–33) – and we do not claim that intentions regarding causing eventualities have the same properties as intentions regarding caused changes-of-state. We thus set this issue aside. The key point is that there is an inference that the causing subevent also be intended. In sum, P uyto-ka iss- constructions where P is a caused change-of-state predicate entail that the agent has a desire for the result state defined by P, believes that the eventuality she performs will achieve this result, and finally intends to perform a causing eventuality.

Crucially, in a pragmatic context where all three of these conditions obtain, zero result readings of caused change-of-state predicates are acceptable:

\[
(14) \quad \begin{align*}
[ \text{Peter believed pushing the paper would fold it. He wanted it folded, so he intentionally pushed it.} ]
\end{align*}
\]

\[
\text{Peter-ka cong-i-lul cep-ess-ciman, cong-i-ka cep-hi-ci anh-ass-ta.} \\
\text{Peter-NOM paper-ACC fold-PST-but paper-NOM fold-PASS-COMP NEG-PST-DECL}
\]

(lit.) ‘Peter folded the paper, but it was not folded.’
This suggests that zero result readings are compatible with the same contexts as *P uyto-ka iss*. Furthermore, overtly denying any of these components is contradictory, just as with *P uyto-ka iss*. For example, each of the following examples contains a caused change-of-state description with the result denied, thus forcing a zero result reading. A continuation denying the truth of desire for a result as in (15a), belief about causation as in (15b), or the intention to perform the causation action as in (15c) all result in a contradictory discourse:

(15) a. *Peter-ka changmwun-ul kkay-ss-ciman, changmwun-i kkay-ci-ci*

   Peter-NOM window-ACC break-PST-but window-NOM break-PASS-COMP
   anh-ass-ta. #kulentey Peter-nun changmwun-i kkay ci-nun
   NEG-PST-DECL by_the_way Peter-TOP window-NOM break.COMP PASS-REL
   kes-ul wenha-ci anh-ass-ta.
   thing-ACC want-COMP NEG-PST-DECL
   (lit.) ‘Peter broke the window, but it was not broken. By the way Peter didn’t want the window to be broken.’
   (No desire for result)

b. *Peter-ka changmwun-ul che-se kkay-ss-ciman, changmwun-i kkay-ci-ci*

   Peter-NOM window-ACC hit-by break-PST-but window-NOM break-PASS-COMP
   anh-ass-ta. #kulentey Peter-nun changmwun-ul chi-nun kes-i
   NEG-PST-DECL by_the_way Peter-TOP window-ACC hit-REL thing-NOM
   changmwun-ul kkay-l swu iss-ta-nun kes-ul mol-lass-ta.
   window-ACC break-REL way exist-DECL-REL thing-ACC not_know-PST-DECL
   (lit.) Peter broke the window by hitting it, but it was not broken. By the way Peter didn’t think that hitting the window could break it.’
   (No belief about causation)

c. *Peter-ka changmwun-ul kkay-ss-ciman, changmwun-i kkay-ci-ci*

   Peter-NOM window-ACC break-PST-but window-NOM break-PASS-COMP
   anh-ass-ta. #kulentey Peter-nun changmwun-ey silswulo pwuticchi-n
   NEG-PST-DECL by_the_way Peter-TOP window-to by_mistake bump-REL
   kes-i-ess-ta.
   thing-COP-PST-DECL
   (lit.) Peter broke the window, but it was not broken. By the way he bumped into the window by mistake.’
   (No intention to cause)

These data suggest that the additional meaning component found in zero result interpretations of caused change-of-state predicates is (or at least overlaps significantly with) the meaning of *P uyto-ka iss* constructions. Thus intention seems to be a component of Korean zero result readings.

Conversely, if any result obtains – partial result or culmination – both intentionality and non-intentionality are compatible with the predicate. In particular, in the same pragmatic context as in (14) a caused change-of-state predicate on a culmination or partial result reading is felicitous:

(16) [ Peter believed pushing the paper would fold it. He wanted it folded, so intentionally pushed it.]

   *Peter-ka congi-lul cep-ese, congi-ka cokum/wancenhi cep-hi-ess-ta.*
   Peter-NOM paper-ACC fold-since paper-NOM a_little/completely fold-PASS-PST-DECL
   (lit.) ‘Since Peter folded the paper, it was a little/completely folded.’
But if any of the conditions fails to obtain, partial result and culmination are still possible, e.g. in any of the contexts in (17) – each of which explicitly precludes one of the conditions for diagnosing intention listed above – the predicate is still acceptable.

(17)  [ Context 1: Peter did not want the paper to be folded, but knew pushing it would in principle fold it. He pushed it, though in this case not expecting it to fold. ]  (No desire for a result)
[ Context 2: Peter wanted the paper folded and deliberately pushed the paper, but did not know that pushing the paper could fold it. ]  (No belief about causation)
[ Context 3: Peter wanted the paper folded and knew pushing the paper would fold it, but accidentally pushed the paper. ]  (No intention to cause)

Peter-ka congi-lul (uytohacianhkey/#uytocekulo) cep-ese congi-ka
Peter-NOM paper-ACC unintentionally/intentionally fold-since paper-NOM
cokum/wancenhi cep-hi-ess-ta.
a_little/completely fold-PASS-PST-DECL
(lit.) ‘Since Peter (unintentionally/intentionally) folded the paper, it was a little/completely folded.’

In sum, zero result readings of caused change-of-state predicates are unique in requiring intentionality on the part of the subject, something not required on partial result or culmination readings.

3.3 A potential counterexample: mistaken agents
We note one potential counterexample to the claim that Korean zero result readings require intentionality, previously discussed by J. Lee (2016a: 123–124, 2016b: 333, 335–336), and Martin (2016: 5–6). In particular, silswulo ‘accidentally’ is acceptable in a context where the subject intended to perform a certain action but mistakenly performed a different action, as in (18).

(18)  [ A balloon and a ball are in the room. Jane intended to kick the ball and not the balloon, but mistook the balloon for the ball and tried to kick the balloon, thinking it was the ball. ]
Jane-i silswulo pwungsen-ul cha-ss-ciman, pisnaka-ss-ta.
Jane-NOM accidentally balloon-ACC kick-PST-but miss-PST-DECL
(lit.) ‘Jane accidentally kicked the balloon, but missed it.’

This might suggest that non-intentional zero result readings are possible. However, it is crucial in this context that there be an intention to kick a particular object that the speaker believes to have certain properties. In a context where there is no intention at all, the sentence is ruled out:

(19)  [ A balloon and a ball are in the room. Jane has no desire to kick either, but out of boredom makes a random kicking motion near what she thinks is the ball. It is actually the balloon. ]
#Jane-i silswulo pwungsen-ul cha-ss-ciman, pisnaka-ss-ta.
Jane-NOM accidentally balloon-ACC kick-PST-but miss-PST-DECL
(lit.) ‘Jane accidentally kicked the balloon, but missed it.’

Still further, what silswulo seems to mean in (18) is something more like ‘mistakenly’. This is evidenced by the fact that in the same context an event description that more closely conforms to the agent’s beliefs – in this case that the balloon is actually a ball – is unacceptable:

(20)  [ A balloon and a ball are in the room. Jane intended to kick the ball and not the balloon, but mistook the balloon for the ball and tried to kick the ball, thinking it was the ball. ]
Here there is intentionality but not mistaken identity, and the modifier is infelicitous. This suggests that *silswulo* is acceptable if there is mistaken identity (even in intentional, zero result readings as in (18)) or non-intentionality (as with partial result or culmination readings as in (10), regardless of mistaken identity). This is exactly the conclusion of Martin (2016: 5–6), who also cites Kamp (1999-2007) on modifiers that can generally mean both “mistaken” and “accidental”. Most importantly, the evidence still suggests that intention to achieve a specific outcome is always important for zero result interpretations. For the remainder of the paper we set mistaken identity aside.\(^4\)

### 3.4 Ambiguity vs. vagueness

We now return to the question of what gives rise to zero result readings. We suggested above that caused change-of-state predicates might simply be vague about the occurrence of a result, which arises (on a partial result or culmination reading) by conversational implicature. However, the fact that zero result readings require intentionality argues against this: the reading without a result is not strictly more general than the readings with a result, since the former includes an intentionality constraint absent in the latter. Thus zero result must be a wholly separate reading.

Supporting evidence for this comes from standard ambiguity diagnostics (J. Lee 2016b). First, if these verbal predicates are vague then both readings should have the same logical content and thus simultaneously asserting and denying the same surface predicate should result in a contradiction. However, the following is not contradictory:

(21)  *Bill-i*  
*mwun-ul*  
*yel-ess-ciman,*  
*mwun-ul*  
*ye-n*  
*kes-un*  
*ani-ta.*  

(lit.) ‘Bill opened the door but it is not the case that Bill opened the door.’

The preferred reading here is that Bill tried to open the door, but did not actually open the door, though with some contextual support the reading that Bill opened the door but did not try to open the door is also possible. In other words, it can mean roughly “Bill tried to open the door but did not open the door” or “?Bill opened the door but did not try to open the door”.\(^5\) Similarly, a distributive reading across a conjoined subject in a context where one agent intended but failed to achieve the result and the other accidentally succeeded has a zeugmatic feel to it:

(22)  [ Bill tried to open the door but failed and Jane accidentally opened the door. ]

?*Bill-kwa Jane-i*  
*mwun-ul*  
*yel-ess-ta.*  

Bill-and  
Jane-NOM  
door-ACC  
open-PST-DECL  

(lit.) ‘Bill and Jane opened a door.’

\(^4\)Martin (2016: 8–9) also notes another type of supposedly accidental zero-result readings in Korean where the agent does something absent-mindedly. However, she analyzes these as a type of intention-in-action in the absence of prior intention (building on Searle 1983), ultimately assimilating them to mistaken agents (p.19). Given that intention is still again involved in some sense we also set these aside.

\(^5\)This is a rough paraphrase. In Section 4.1 we address distinctions between zero result and Korean “try to P” predicates. That the reading where culmination is asserted is somewhat less preferred is likely due to the fact that by default the reading of a caused change-of-state predicate is culmination and there are more direct ways to explicitly deny intentionality for a result that actually obtained.
This suggests that the predicate has a failed attempt or (possibly accidental) result reading, but does not allow both simultaneously, as predicted on an ambiguity approach. Finally, consider VP-ellipsis with an antecedent containing a caused change-of-state predicate:

    Jane-NOM book-ACC burn-CAUS-PST-and Max-also do\_so-PST-DECL
    ‘Jane burned a book and so did Max.’

On the assumption that VP-ellipsis involves some formal identity between the antecedent and elided VP (Lakoff 1970, though see Zwicky and Sadock 1975), if thay-wu- ‘burn’ were vague in its meaning, we might expect any combination of readings to be possible in (23), i.e. zero result (with intention) or partial result or culmination (with or without intention) should be freely available for either conjunct. But this is not the case. Rather, there are two classes of readings available. Either both conjuncts involve intentionality (regardless of result) or both involve result (regardless of intentionality). To put it another way, (23) either means roughly “Jane tried to burn a book and so did Max” or “Jane burned a book and so did Max”. What is not possible is a reading where one conjunct describes zero result and the other non-intentional result (partial or complete).

These data suggest an analysis in which caused change-of-state predicates are formally ambiguous between two readings: one entailing intentionality but vague on a result (deriving zero result), and one entailing a result but vague on intentionality (a generalization consistent with the Complementarity of Intentionality and Affectedness hypothesis of J. Lee 2016b: 338). The key point is that the different readings arise by ambiguity, not vagueness, arguing against an analysis by implicature (cp. analyses of non-culmination in St’át’imcets and Skwxwú7mesh of Bar-el et al. 2005 and French and German in Martin 2015 and Martin and Schäfer 2017). That said, in principle both uses admit an intentional partial result or culmination reading. Thus in order to disambiguate, we continue to use explicit (pragmatic or linguistic) denial of a result to get at the reading that entails only intentionality and explicit (pragmatic or linguistic) denial of intentionality to get at the reading that entails only a result. We next turn to several additional constraints on zero result that suggest its limits and unique status in Korean.

4 Additional semantic and grammatical constraints on zero result readings

4.1 Trying vs. zero result: constraints on causal relations

A simple analysis might be that zero result is covertly identical to P nolyekha- ‘P try’ “try to P”, where P is a caused change-of-state predicate, which also entails intention and is vague on result (we omit the explication of the specific intentionality properties in Section 3.2, all of which P nolyekha- entails; Grano 2011: 438 explicitly claims that English try also involves intention):

(24) ku-ka pwul-ul khi-lye-ko nolyekhay-ss-ta. #kulena ku-nun pwul-ul
    ku-NOM light-ACC turn\_on-to-COMP try-PST-DECL but he-TOP light-ACC
    khi-l uyto-nun eps-ess-ta.
    turn\_on-REL intention-TOP not_exist-PST-DECL
    ‘He tried to turn on the light. #But he did not have an intention to turn on the light.’

However, there is a key difference between P nolyekha- constructions and zero result. With zero result the causing eventuality must represent a fairly direct cause of the result, and not just any causal eventuality (see Martin 2015: 255–256 for a similar point). For example, if we assume causal relationships can be analyzed via causal chains (see e.g. Lewis 1973: 563; Dowty 1979:
99–110; Croft 1990; Kratzer 2005: 197–198; *inter alia*), the cause must be relatively direct and/or in close proximity to the result on the causal chain. Thus for the following examples, if Emma does not know how to fix her computer then learning how to fix it is a prerequisite for her being able to knowledgeably fix it herself, and thus there is a causal dependency between those two events. But learning how to fix a computer is (intuitively) not a direct cause of fixing one. Crucially, in a context where Emma makes some effort to learn how to fix the computer but is ultimately unable to, a *P nolyekha-* construction is acceptable but not a zero result reading:

\[(25) \quad \text{Emma did not know how to fix her computer. She began to learn how, but did not finish. She never fixed the computer.} \]

a. *Emma-nun khemphyute-lul kochi-lye-ko nolyekhay-ss-ta*  
   Emma-TOP computer-ACC fix-to-COMP try-PST-DECL  
   ‘Emma tried to fix the computer.’

b. *#Emma-nun khemphyute-lul kochi-ess-ta.*  
   Emma-TOP computer-ACC fix-PST-DECL  
   (lit) ‘Emma fixed the computer.’

However, *P nolyekha-* is not completely devoid of constraints on the causing action: in a context where Emma did absolutely nothing at all to fix the computer whatsoever, (25a) is *not* felicitous. This is consistent with Sharvit (2003), who analyzes English *try* as describing a contextually sufficient minimal event that could develop into one described by the complement of *try* (building on Landman 1992), or Grano (2011), who allows that *any* such minimal event can satisfy the conditions for *try*. Finally, in a context where Emma makes a direct effort to fix the computer (e.g. opens it up and tinkers with it) but happens to fail, both sentences in (25) are felicitous. In sum, while some action is required in both *P nolyekha-* and zero result readings, there are stricter constraints on what the agent must do on a zero result reading, namely direct causation. Thus zero result readings cannot be wholly reduced to some kind of covert *P nolyekha-* construction; it is derived by some other means. Note, however, that direct causation is not limited to zero result – partial result and culmination also require this. Thus out of context (25b) admits partial result and culmination readings, but only if Emma directly (partially) fixes the computer and not, say, if she buys the tools necessary to fix it but someone else does it. Thus direct causation applies to all readings of caused change-of-state predicates, but not *P nolyekha*-, a point that will be crucial below.

### 4.2 Grammatical constraints on zero result interpretations: subject intentions

There is an additional grammatical constraint on zero result, namely that the relevant set of intentions must be those of the grammatical subject of the clause. The first immediate prediction of this hypothesis is that inanimate subjects – which definitionally cannot have intentions – should be excluded from being the subject on a zero result interpretation of a caused change-of-state predicate. This is exactly as seen in the following data, where DPs denoting inanimate artifacts, natural forces, causal properties of some participant (such as their negligence; Beavers and Zubair 2013: 24–26,32), and causal actions are all possible as subjects of caused change-of-state predicates in general, but in these cases zero result interpretations are ruled out (and see also Demirdache and

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6There may be other causal chains leading to the computer being fixed, e.g. Emma accidentally fixing it or having someone guide her through the process. Our goal is just to identify at least one non-trivial causal chain that would lead to it being fixed to verify that zero result and *P nolyekha-* tolerate different degrees of directness of causation.
Martin 2015: 201–210 for similar data in a range of other languages). This is evidenced by the fact that with such subject DPs denial of the result is no longer possible:

(26)  

a. *ku opun-i ppang-ul kwu-wess-ta.* #haciman, *ppang-i kwu-we*  
the oven-NOM bread-ACC bake-PST-DECL but bread-NOM bake-COMP  
ci-ci  
anh-ass-ta.  
PASS-COMP NEG-PST-DECL  
(lit.) ‘The oven baked the bread. But bread was not baked.’ (inanimate individual)  
b. *chentwung-i changmwun-ul kkay-ss-ta.* #haciman, *changmwun-i*  
thunder-NOM window-ACC break-PST-DECL but window-NOM  
kkay-ci-ci  
anh-ass-ta.  
break-PASS-COMP NEG-PST-DECL  
(lit.) ‘The thunder broke the window. But the window did not break.’ (natural force)  
c. *Julia-uy pwucwuuy-ka pwul-ul kke-ss-ta.* #kulena *pwul-i*  
Julia-GEN negligence-NOM light-ACC turn_off-PST-DECL but light-NOM  
kke ci-ci  
anh-ass-ta.  
turn_off-COMP PASS-COMP NEG-PST-DECL  
(lit.) ‘Julia’s negligence turned off the light. But it was not turned off.’ (causal property)  
d. *Minji-ka cencaleynci-lul thul-un hayngtong-i ku an-ey iss-ten*  
Minji-NOM microwave-ACC turn_on-REL action-NOM the inside-in exist-REL  
mwul-ul  
kkulh-i-ess-ta.  
break-PASS-PST-DECL but water-NOM boil-COMP NEG-PST-DECL  
(lit.) ‘Minji’s action of turning on the microwave boiled the water in it. But the water did not boil.’ (causal action)

This is true even if it is clear from context that there is an animate agent participant in the causing eventuality. For example, the judgments in (26c) and (26d) hold despite there being some animate participant – Julia and Minji respectively – who is the semantic agent in these contexts. Similarly, if it is known in context that someone is manipulating the oven, (26a) is still not acceptable on the zero result interpretation. This is not limited to inanimate subjects; even if the head noun of the subject DP is animate intention cannot be transferred to some other entity, e.g. in the following it must be the friend and not Julia who intends to break the vase on a zero result reading:

(27)  

[ Julia intended to break the window, but her friend had no such intention. ]  
  
Julia-uy  
chinkwu-ka changmwun-ul kkay-ss-ciman, #changmwun-i kkay-ci-ci  
Julia-GEN friend-NOM window-ACC break-PST-but window-NOM break-PASS-COMP  
anh-ass-ta.  
NEG-PST-DECL  
(lit.) ‘Julia’s friend broke the window, but it was not broken.’

This is all in contrast to data in Martin and Schäfer (2017: 104–105) on French and German offer verbs whereby instrument subjects can license zero result if there is an implicit agent in context (Martin and Schäfer 2017: 104, (37a)):
(28) Ce traitement médical l’a soigné, et pourtant ça n’a rien changé à son état.

(lit.) ‘This medical therapy treated him, and yet it didn’t change his state at all.’ (French)

Conversely, the relatively direct translation of (28) is not acceptable in Korean:7

(29) i sinyak-i ku-lul chilyohay-ss-ciman, #ku-uy sangthay-lul cenhye
this new medicine-NOM he-ACC treat-PST-but he-GEN state-ACC at_all
pakkwu-ci anh-ass-ta.
change-COMP NEG-PST-DECL

(lit.) ‘This new medicine treated him, but it did not change his state at all.’

Altogether, this suggests that in Korean the intentionality requirement is partly grammatical in nature: it must be the referent of the grammatical subject that bears this interpretation, not simply whatever participant is entailed to be the agent more generally. This is like P uyto-ka iss- ‘P intention-NOM exist’ “have an intention to P” and P nolyekha- ‘P try’ “try to P” constructions, both of which also disallow inanimate subjects and transfer of intentionality to a non-subject:

(30) a. #chentwung-i changmwun-ul kkay-lye-ko nolyekhay-ss-ta.
    thunder-NOM window-ACC break-to-COMP try-PST-DECL
    (lit.) ‘The thunder tried to break the window.’

b. #chentwung-i changmwun-ul kkay-l uyto-ka iss-ess-ta.
    thunder-NOM window-ACC break-REL intention-NOM exist-PST-DECL
    (lit.) ‘The thunder had an intention to break the window.’

c. [ Julia intended to break the window, but her friend had no such intention. ]
   i. #Julia-uy chinkwu-ka changmwun-ul kkay-lye-ko nolyekhay-ss-ta.
      Julia-GEN friend-NOM window-ACC break-to-COMP try-PST-DECL
      (lit.) ‘Julia’s friend tried to break the window.’
   ii. #Julia-uy chinkwu-ka changmwun-ul kkay-l uyto-ka iss-ess-ta.
       Julia-GEN friend-NOM window-ACC break-REL intention-NOM exist-PST-DECL
       (lit.) ‘Julia’s friend had an intention to break the window.’

Thus whatever these two constructions share in common with zero result readings of caused change-of-state predicates must be what ensures the restriction that the relevant intentions be those of the grammatical subject. We next turn to a further refinement of this condition.

4.3 Grammatical constraints on zero result interpretations: active voice

A further constraint on the individual whose intentions matter has to do with voice. Passives of actives allowing a zero result reading do not allow such a reading, regardless of whether the passive is formed morphologically by -i, -hi, -li, -ki, analytically via passive auxiliary ci- or inchoative verbs kaha- ‘give’ or tangha- ‘undergo’, or is an unmarked but lexically passive verb as with mac-

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7We use the subject i sinyak-i ‘this new medicine-NOM’ “this new medicine” instead of the more direct translation i uylyo yopep-i ‘this medical therapy-NOM’ “this medical therapy” since for some reason the latter independently sounds awkward as the subject of the verb translating as treat.
‘be beaten’ (for more on passives in Korean see Sohn 1999: 367-373 and Yeon 2015). Thus all of the following entail culmination while their corresponding actives do not (though we omit those data here for space reasons; in the case of the lexical passive the corresponding active might be an active equivalent like ttayli- ‘beat’):

(31) a. talkthel-i ttuti-ki-ess-ciman, #talkthel-i kutaylo-yess-ta.
    chicken_hair-NOM pluck-PASS-PST-but chicken_hair-NOM same-PST-DECL
    (lit.) ‘The chicken was plucked, but the chicken was the same.’

b. Minji-eyuyhay pwul-i khi-e ci-ess-ta. #haciman, pwul-i
    Minji-by light-NOM turn_on-COMP PASS-PST-DECL but light-NOM
    kutaylo kke-ci-e iss-ta.
    same turn_off-PASS-COMP exist-DECL
    (lit.) ‘The light was turned on by Minji. But the light is still turned off.’

c. Mary-ka John-eykey ilkyek-ul tanghay-ss-ciman, #Mary-ka mac-ci
    Mary-NOM John-to one_blow-ACC undergo-PST-but Mary-NOM be_hit-COMP
    anh-ass-ta.
    NEG-PST-DECL
    (lit.) ‘Mary received a blow from John, but Mary was not hit.’

    Alice-NOM he-to be_beaten-PST-but Alice-NOM dodge-PST-DECL
    (lit.) ‘Alice was beaten by him, but she dodged.’

One might explain these data by saying that the intentions must be those of the subject DP but (for some reason) subjects of passives cannot have intentions regarding the described event, presumably because they lack control over it. However, this is not sufficient. For example, in Korean passives a modifier like uytocekulo ‘intentionally’ can be licensed in a context where it was the patient rather than the agent’s intentions being described. This is illustrated in (32) for a -hi passive and a lexical passive (the other passives behave similarly; we omit these data for space reasons).8

    Minho-NOM monster-to intentionally eat-PASS-PST-DECL
    (lit.) ‘Minho was intentionally eaten by the monster.’
    = ‘Minho was eaten by the monster and this was what Minho intended.’

b. Alice-ka uytocekulo ku-eykey mac-ass-ta
    Alice-NOM intentionally he-to be_beaten-PST-DECL
    (lit.) ‘Alice was intentionally beaten by him.’
    = ‘Alice was beaten by him, and this was what Alice intended.’

However, in this case a zero result reading is nonetheless still ruled out:

(33) a. Minho-ka koymwul-eykey uytocekulo mek-hi-ess-ciman, #Minho-nun kyelkwuk
    Minho-NOM monster-to intentionally eat-PASS-PST-but Minho-TOP finally
    mek-hi-ci anh-ass-ta.
    eat-PASS-COMP NEG-PST-DECL

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8This reading arises when the semantic agent is marked by eykey ‘to’ but not when it is marked by eyuyhay ‘by’; we do not account for this distinction here.
(lit.) ‘Minho was intentionally eaten by the monster, but Minho was not finally eaten.’
= ‘Minho was eaten by the monster and this was what Minho intended, but Minho was not ultimately eaten.’

b. Alice-ka uytocekulo ku-eykey mac-ass-ciman, #Alice-ka mac-ci  
   Alice-NOM intentionally he-to be-beaten-PST-but Alice-NOM be-beaten-COMP  
   anh-ass-ta.  
   NEG-PST-DECL  
   (lit.) ‘Alice was intentionally beaten by him, but she was hit.’
= ‘Alice was beaten by him and this was what Alice intended, but Alice was not ultimately beaten.’

A reviewer, however, suggests that the following passives may allow zero result readings:

(34) a. Mary-ka John-eykey uytocekulo hyeppak-tang-hayss-ciman, Mary-nun sasil  
   Mary-NOM John-to intentionally threat-PASS-do-but Mary-TOP actually  
   amulen hyeppak-to pat-ci ahn-ass-ta.  
   at.all threat-even receive-COMP NEG-PST-DECL  
   (lit.) ‘Mary was intentionally threatened by John, but Mary was not actually threatened at all.’

b. ku kangmwul-i samlamtul-eyuyhay uytocekulo mak-a-ci-ess-ciman,  
   the river-NOM people-by intentionally block-COMP-PASS-PST-but  
   kutul-un ku sanawun kangmwul-ul mak-ul swu eps-ess-ta.  
   they-TOP the violent river-ACC block-REL way not_exist-PST-DECL  
   (lit.) ‘The river was intentionally blocked by the people, but they could not block the violent river.’

Yet there is reason to think that these two passives do not allow zero result readings, once the nature of the lexically entailed result is clarified. In (34a) Mary need not feel threatened, but the threat must reach her regardless of how she felt. The first clause is not acceptable in a context where John and Mary are separated by a thick glass wall and she cannot hear anything he says. So the entailed result is the arrival of the threat, not feeling threatened. Similarly, in (34b) while the river need not be blocked permanently or for an extended period of time, it must have been at least momentarily blocked. Thus in a context where the river was not blocked at all the first clause is infelicitous (e.g. adding an adverb hanswunkanto ‘not for one second’ is not possible in (34b)). Thus the passivized verb seems to entail a minimum of at least some blocking, a type of culmination. The entire discourse in (34b) conveys that while the river may have been momentarily blocked the job of blocking it is not finished. In sum, zero result readings are ruled out in passive voice. The overall conclusion is that the referent of the grammatical subject of an active voice predicate is what has the relevant intentions on zero result readings.

5 Analysis: sublexical modality and scalar semantics

5.1 Central generalizations
To sum up, Korean caused change-of-state predicates admit a systematic ambiguity between a reading where intentionality is entailed but a result is not and one where a result is entailed but intentionality is not. Zero result readings arise from the former use when the result is known not to obtain. These uses also have grammatical conditions such that they only arise in active voice and
only when the relevant intentions are the subject’s. Partial result and culmination readings arise from the other use and lack all of these conditions: the result must obtain to at least some degree, but there are no intentionality requirements nor grammatical constraints. In all cases, though, the causing eventuality must be relatively direct. We offer an analysis of these readings as involving essentially two cross-cutting features that have figured prominently in prior works on non-culmination in other languages: (a) that the relevant result state need not obtain at the actual world but may obtain at some other possible world, building on Dowty (1979), Koenig and Muansuwan (2000), Bar-el et al. (2005), Tatevosov (2008), Beavers (2011a), and Martin and Schäfer (2012, 2017), *inter alia*, and (b) that there is a scalar semantics to change that derives the partial result vs. culmination distinction, building on Hay et al. (1999), Koenig and Chief (2008), Kennedy and Levin (2008), and Beavers (2011a, 2013). In some cases significant interactions of the two components produce mixed types of non-culmination. In other words, Demirdache and Martin (2015: 190–192) identify both scalar and modal analyses of non-culmination as necessary in various languages, and the facts suggest that in Korean a mixture of the two types of accounts is needed in a single language, albeit subject to still further language particular constraints. We first begin by motivating the central ingredients of modality and scalar change, and then present our formal analysis. We then examine additional predictions of our analysis which further support it for Korean.

5.2 Modality in zero result

Given that the result state does not obtain in zero result interpretations, one possibility might be to say that the result state is not part of the truth conditional content of the predicate at all. Instead the predicate is actually an activity predicate whose event structure simply denotes an action on the part of the subject. However, consider the following minimal pair, both of which allow zero result: (35)

   open-PST-DECL/close-PST-DECL
   ‘He opened/closed the window.’

First, as noted above, there is a requirement that on the zero result reading the result we claim is named by the predicate must be the intended outcome. Thus *yel-ess-ta* allows a zero result reading only if the agent intends the window to be open and *tat-ass-ta* if the agent intends it to be closed. This suggests a lexical distinction between the verbs centered around a (potential) result, above and beyond any pure action described by the verb. Furthermore, many of the same actions (e.g. pushing a button) could in some contexts be compatible with both opening or closing a window. If these two predicates just describe a set of actions, then in cases where the actions overlap they should both be possible descriptions. But they have different distributions. Even in a button-pushing context, on a zero result reading *yel-ess-ta* is only possible if the window is not already open and *tat-ass-ta* is only possible if the window is not already closed. Still further, as a reviewer notes, there may be other types of actions that are only appropriate for one verb or the other hinging on the initial state of the window and whether it is being moved away from or toward the frame (assuming a swinging window). Crucially, this would mean that actions appropriate for each are constrained by the nature of the change they would accomplish (e.g. on a scalar analysis of change as we adopt below, the actions are constrained to be those that move the window in different directions along a scale of openness/closedness), suggesting again that a notion of result is part of the meaning of the verbs here and not just sets of actions entirely divorced from their results.
In sum, these verbs somehow describe different results despite not entailing them to come about, meaning the result must broadly be part of the meaning of each. This is analogous to the “imperfective paradox” of Dowty (1979: Ch.3), whereby John is crossing the street describes an event of crossing a street yet it does not entail that a street is crossed. To account for how something can be part of the meaning of a predicate without obtaining at the real world, Dowty (1979: 145–154) posits that while the initial portions of the event obtain at the real world, the result obtains at some inertial world, i.e. a world similar to the real world up to a certain point in time where things diverge. This suggests that modality is relevant for zero result as well, and indeed an inertial analysis has been extended to non-culmination in Koenig and Muansuwan (2000), Bar-el et al. (2005), and Tatevosov (2008) for exactly this reason. Our own analysis follows in this tradition, albeit constraining the set of possible worlds in terms of intentions.

5.3 Partial result as non-quantized change

Partial result and culmination readings pattern as distinct from zero result readings in at least two respects: (a) the latter entail no change of state, while the former entail at least some, and (b) the latter has a specific intentionality requirement the former two lack. This suggests that zero result readings should be treated as distinct from the other two, which form a natural class. In particular, building on insights from Koenig and Chief (2008), we suggest that what we have so far called partial result and culmination readings for Korean caused change-of-state predicates boil down to the difference between non-quantized and quantized change respectively as in Hay et al. (1999) and Beavers (2011b, 2013), crucially therefore relying on a scalar analysis of change-of-state. On this approach, change-of-state more generally can be analyzed as change along a scale defining the possible states of the patient over the course of the event (see also e.g. Tenny 1994; Krifka 1998; Kennedy and Levin 2008; Rappaport Hovav and Levin 2010, inter alia), but predicates may differ in specificity about what exact state on the scale is the final result state. The two types of reading are exemplified by English degree achievement predicates such as those headed by warm or cool (Dowty 1979: 88–90). When such predicates name a specific result state on the scale as in (36a) (or an endpoint is known from context) then the predicate entails that the patient reached that exact state and the predicate is telic. This is quantized change. When no such endpoint is given or known from context or otherwise expected there is no particular entailment of change other than the patient being a different temperature than before and the predicate admits an atelic reading, as in (36b), though a telic reading is always possible as well depending on contextual support for a specific result state. This is non-quantized change.

(36) a. John cooled the soup to 100 degrees in/?for five minutes.

b. John cooled the soup for/in five minutes.

There are many ways to formally implement this idea (see e.g. Hay et al. 1999 and Beavers 2011b for two possibilities), and the implementational details do not matter here. The key point across all analyses is that telicity arises when a specific final state of the patient is entailed, defining the culmination point of the event, and atelicity arises if the predicate is vague as to the final state, so...
that the event’s culmination point is also left vague. We suggest that Korean culmination readings are like quantized change in (36a) and partial result readings are like non-quantized change in (36b).

Three pieces of evidence support this conclusion. The first is that culmination readings and partial result readings differ in what the ultimate entailed state of the patient is, as already discussed in Section 2. Second, the non-quantized change analysis of partial result readings predicts that the culmination and partial result readings should differ in the property of telicity, where the complete reading should be telic and the partial reading should admit an atelic reading, though again a telic reading should be possible as well depending on contextual support for a specific partial result state, a prediction that is also borne out:

(37) a. Jane-i chayk-ul sam pwun maney/?tongan wancenhi thay-wu-ess-ta
    Jane-NOM book-ACC three minute in/for completely burn-CAUS-PST-DECL
    ‘Jane burned the book completely in/?for three minutes.’

    Jane-NOM book-ACC three minute for/in a little burn-CAUS-PST-DECL
    ‘Jane burned the book a little for/in three minutes.’

A reviewer asks, however, if the atelicity of (37b) is not due to the sort of aspectual coercion that is known to generally permit accomplishments to be interpreted as activities (see e.g. Krifka 1998: 215; de Swart 1998: 361–362; and Rothstein 2004: 114–115, 190–191, among others). In general one of the hallmark properties of aspectual coercion is the requirement of specific contextual support. However, as discussed further in the next section, degree achievements are not all aspectually homogeneous, with some preferring telic readings and others atelic readings by default, and shifting between these readings can sometimes require contextual support. Thus it is not clear what would distinguish between a scalar-based degree achievement analysis of partial result and one lacking that property but that involves aspectual coercion. Indeed, perhaps what has been called “aspectual coercion” in prior literature is best analyzed in terms of a scalar component anyway, especially if a less than complete result obtains, which is readily modeled via (gradable) scales.

The third piece of evidence for a degree achievement analysis of the partial/complete result difference has to do with which predicates allow partial result readings. As Beavers (2013: 692–703) discusses, on a scalar analysis the difference between accomplishment and achievement predicates (i.e. durative vs. punctual change-of-state predicates) is the difference between changes along gradable (multi-point) vs. non-gradable (binary) scales respectively, and furthermore non-quantized change readings are only available for accomplishments and not achievements. This is because with achievements the quantized vs. non-quantized distinction is vacuous; a binary scale consists of just two states ¬φ and φ, and the only possible change from state ¬φ to state φ. Whether the final state is expressly stipulated to be φ on a quantized change reading or is technically left unspecified on a non-quantized change reading, it will still be interpreted as φ. Thus there is no meaningful difference between quantized change vs. non-quantized change readings. For gradable scales the distinction is contentful: on a non-quantized reading there are many possible states the patient could end up in, but only one specific state among those is possible on a quantized reading, deriving a non-vacuous difference. If partial result is analyzed as non-quantized change then the prediction is that only accomplishments should allow it and not achievements. That accomplishments do allow these readings is shown by examples such as the following:
(38)  *Jane-i cip-ul cokum ci-ess-ta.*
   Jane-NOM house-ACC a little build-PST-DECL
‘Jane built a house a little.’

In general, achievements only permit complete culmination readings, and not partial result:

    Jane-NOM office-ACC a little leave-PST-DECL
‘Jane left the office (#a little).’

   b.  *Jane-i ophisu-ey (#cokum) tochakhay-ss-ta.*
    Jane-NOM office-to a little arrive-PST-DECL
‘Jane arrived at the office (#a little).’

The only exception to this is under a type of scalar coercion whereby a canonically non-gradable scale is somehow reinterpreted as gradable in context. Thus the modifier *cokum* ‘a little’ in (39) improves if it is clarified in pragmatic context that the path of motion (qua the scale that measures out the event) is somehow extended, e.g. Jane’s office is very large and her office chair is far from the door in (39a) or her office is quite far from the elevator in (39b). However, building on Beavers (2012: 50–52), with sufficient contextual support coercion qua reconceptualizing scalar gradability of this sort is a generally available process independent of partial result (see e.g. Gyarmathy 2015 on scalar coercion of achievements in progressive aspect). Given its general availability, it is orthogonal to the larger point that predicates whose interpretation by default disallows gradable interpretations do not allow partial result readings without coercion. Taken together, these data suggest that the right analysis of the partial result vs. culmination reading in Korean is that of non-quantized vs. quantized change, distinct from zero result, which has a modal component. We turn to a formal analysis of these facts and the interaction of those two components next.

### 5.4 Formal framework

First and foremost, we assume all verbal predicates are associated with event structures qua constraints on the verb’s truth conditional content *à la* Dowty (1979) that decompose the event into a structured series of subevents, where caused change-of-state predicates entail that an eventuality (state or event) on the part of the agent causes a change-of-state in the patient. Standardly the subject and object are taken to denote individuals qua concrete entities in the world (e.g. *John broke the window*). However, as noted in Section 4.2, it is possible to also have event-denoting and state-denoting subjects in both Korean and English (e.g. *John’s actions/negligence broke the window*). To analyze the fact that eventualities can be subjects of a caused change-of-state verb we adopt the analysis of Beavers and Zubair (2013: 33–34) and assume that caused change-of-state verbs take events in the domain $U_E$ or states in the domain $U_S$ as subjects semantically, which we notate by saying that the causer argument of the verb can be any entity in domain $U_V = U_E \cup U_S$. Furthermore, following on the discussion of quantized vs. non-quantized change in Section 5.3 we analyze change-of-state as scalar and allow that in principle any change-of-state can allow a quantized or non-quantized reading (though see below for some constraints on when this is realized). As noted above the implementational details are not especially relevant; for simplicity we just assume that predicates defining specific states take a degree argument $d$ in domain $U_D$, which defines the degree to which the given state holds along the scale with which it is lexically associated.
Thus the analyses of English *break* and *cool* are the following for $y$ an individual in domain of individuals $U_I$, $s$ a state in $U_S$, $d$ a degree in $U_D$, and $v$ a state or an event in $U_V$:\footnote{Presumably for tense and aspect purposes we would want a further event argument $e$ that is the mereological sum of $v$ and $s$ that constitutes the intuitive overall eventive referent of the entire projected verbal predicate. However, since such an event variable plays no role in any of the data we are concerned with here we set it aside to avoid unnecessary clutter in the formulae. We are only interested in causative verbs here, but inchoative variants of the relevant verbs may be related to the causative variants by some type of reflexivization as has been claimed for Romance languages (Chierchia 2004; Koontz-Garboden 2009), existential-binding of the agent argument as has been claimed for English (Levin and Rappaport Hovav 1995) or certain cases in Sinhala (Beavers and Zubair 2013), or as a paradigmatic contrast of a form lacking causation altogether, either owing to causer deletion from the causative or causativization of the inchoative (e.g. Grimshaw 1982; Härzl 2003; Reinhart 2002).}

\begin{enumerate}
\item $[[\text{break}]] = \lambda y \in U_I \lambda v \in U_V \exists s \in U_S \exists d \in U_D [\text{cause}'(v, s) \land \text{patient}'(y, s) \land \text{broken}'(s, d)]$
  
  “$v$ is the cause of $y$ entering a state $s$ of brokenness to some degree $d$.”

\item $[[\text{cool}]] = \lambda y \in U_I \lambda v \in U_V \exists s \in U_S \exists d \in U_D [\text{cause}'(v, s) \land \text{patient}'(y, s) \land \text{cool}'(s, d)]$
  
  “$v$ is the cause of $y$ entering a state $s$ of being cool to some degree $d$.”
\end{enumerate}

Note that although the degree argument is existentially bound in both cases, this does not mean that the default reading is always atelic. Rather, as Kennedy and Levin (2008) argue in detail (building on Hay et al. 1999; Kearns 2007, *inter alia*) the actual interpretation of the degree argument depends on several factors. For example, if the scale associated with the verb has a maximal endpoint (e.g. *straighten*) this will be taken as the default standard and the reading will be telic unless context overrides this, whereas if the scale is open (e.g. *widen*) the default standard will be that the patient has increased along the scale to at least some non-zero degree, and the reading will be atelic unless a particularized context provides a specific standard. Other factors may matter, too, e.g. as noted above non-gradable scales of achievements (e.g. *arrive*) always have a maximal endpoint and thus are always telic modulo scalar coercion, and also some verbs may have conventionalized usages that bring standards to bear that are not lexicalized per se (e.g. Kennedy and Levin 2008: 159, 178 note that *cool* is often conventionally used in contexts where the standard is well known, such as coolness of different types of coffee, which can favor a telic reading). Finally, some verbs may simply lexically specify a specific result. The key point is that there is always a scalar semantics, and a quantized vs. non-quantized distinction is in principle possible for at least some verbs.

Next, when the subject DP directly denotes a state or event then the subject simply fills in the causing state/event directly, e.g. assuming the DP denotations in (41a-c) we derive the meanings in (41d,e) from (40a) (ignoring the semantic contribution of tense).

\begin{enumerate}
\item $[[\text{the window}]] = \text{window}'$
\item $[[\text{John’s action}]] = \text{John’s-action}'$
\item $[[\text{John’s negligence}]] = \text{John’s-negligence}'$
\item John’s action broke the window.
  $\exists s \in U_S \exists d \in U_D [\text{cause}'(\text{John’s-action}', s) \land \text{patient}'(\text{window}', s) \land \text{broken}'(s, d)]$
\item John’s negligence broke the window.
  $\exists s \in U_S \exists d \in U_D [\text{cause}'(\text{John’s-negligence}', s) \land \text{patient}'(\text{window}', s) \land \text{broken}'(s, d)]$
\end{enumerate}

When the subject intuitively denotes an individual, though, Beavers and Zubair (2013: 34) assume the DP has a generalized quantifier interpretation (Barwise and Cooper 1981: 164–166) that takes a caused change-of-state VP as a complement, binds off the causing event $v$ in the verb’s meaning,
and additionally adds an individual as the effector of \( v \).\(^{11}\) Thus in addition to the standard meaning in (42a) a DP like \( \text{John} \) has an additional causer generalized quantifier meaning as in (42b).

(42) a. \([\text{John}] = \text{john}'\)
    b. \([\text{John}] = \lambda P \exists v \in U_V [\text{effector}'(\text{john}', v) \land P(v)]\)

The intuition is that such DPs introduce the causing event or state the individual they intuitively refer to performed or held respectively, building on the notion “metonymic clipping” of Van Valin and Wilkins (1996: 301) (building in turn on Talmy 1996; see also Levin and Rappaport Hovav 1995: 84) whereby \( \text{John} \) stands in for \( \text{John’s causing actions/properties} \) by virtue of the event-denoting portions being “clipped”. (This may be a subtype of what Littlemore 2015: 29 calls “object involved in an action for the action” metonymy.) Note that the sense of \( \text{John} \) in (42b) only applies to transitive predicates with event-denoting subjects, which we assume are restricted to active voice caused change-of-state predicates – other predicates (e.g. statives, activities, and passives) take individual subjects.\(^{12}\) Thus although we posit a systematic ambiguity for DPs, the meanings are in complementary distribution. Applying (42b) to \( \text{broke the window} \) we get (43).

(43) \( \exists v \in U_V [\text{effector}'(\text{john}', v) \land \exists s \in U_S \exists d \in U_D [\text{cause}'(v, s) \land \text{patient}'(\text{window}', s) \land \text{broken}'(s, d)]]\)

With this framework in place, we now turn to Korean caused change-of-state predicates, starting first with animate subjects before turning to inanimate subjects.

### 5.5 Korean caused change-of-state predicates: animate subjects

For the basic meaning of a Korean verbal root we assume the same analysis as for English, and similarly for subject DPs (from here on we omit argument type constraints for readability):\(^{13}\)

(44) a. \([\text{yel-}] = \lambda y \lambda v \exists s \exists d [\text{cause}'(v, s) \land \text{patient}'(y, s) \land \text{open}'(s, d)]\)
    b. \([\text{John-i}] = \text{john}'\)
    c. \([\text{John-i}] = \lambda P \exists v [\text{effector}'(\text{john}', v) \land P(v)]\)

Unlike English, we propose that in Korean the various subevents within a single event structure may occur at different possible worlds, as in Bar-el et al. (2005), Tatevosov (2008), and Martin and Schäfer (2012, 2017), \textit{inter alia}. However, we suggest that the relevant set of possible worlds for zero result readings are not inertial worlds in the sense of Dowty (1979: 145–154) (as assumed by Koenig and Muansuwan 2000: 162–171, Bar-el et al. 2005: 94–95, and Tatevosov 2008: 400–406), nor worlds that define the “normal” course of events (as per Martin and Schäfer 2012: 253), but instead are all the worlds compatible with the subject’s intentions, building on Inman (1993: 105–157) and Beavers and Zubair (2010: 77–82) (see also the energetic modality of Koenig and Davis 2001: 89, and Grano 2016: 215, 2017).\(^{14}\) On this analysis an individual \( x \) intends \( P \) iff \( P \) is true in

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\(^{11}\)Following Van Valin and Wilkins (1996) we use the label \( \text{effector}' \) for the thematic role associated with the primary participant of a causing eventuality, generalizing over agents and other thematic roles that can be causers.

\(^{12}\)In particular, passive presumably changes the order of composition within the verbal predicate so that the patient – an individual – is the subject, though we ignore the specific implementation details here since they are also partly syntactic and syntax is not our focus here in English or Korean.

\(^{13}\)“Root” refers to the surface verbal morph that serves as the root of the inflected stem, not a theoretical acategorial object as in Distributed Morphology (Halle and Marantz 1993) that serves as the root of a syntactic event structure.

\(^{14}\)Park (1993: 24) also proposes a modal analysis of Korean non-culmination, but does not specify the modal base or discuss intentionality.
all worlds in \( x \)'s intention set \( I_x \), and \( x \) does not intend \( P \) iff there exists some world in \( I_x \) at which \( P \) is false. We can further assume that in all such worlds if \( P \) is a caused change-of-state it must also be true that \( x \) has a desire for the relevant outcome, beliefs about how to obtain them, and intention to perform a causing eventuality, as discussed in Section 3.2. To model conflicting intentions of the agent (as discussed in Section 3.2), we may also wish to assume some contextually-given effective preference ranking à la Condoravdi and Lauer (2016: 24–37) and Grano (2017) that ranks worlds according to how well they match a given intention or set of intentions prioritized for deciding on what actions to take, and assume instead that \( P \) can be intended iff \( P \) is true in all (appropriate) best ranked worlds in \( I_x \), though we set this additional factor aside for simplicity.\(^{15}\) This universal modal operator over the modal base \( I_x \) is what we claim underlies \( P uyto-ka iss\)- ‘P intention-NOM exist’ ‘have an intention to P’ and \( P nolyekha\)- ‘P try’ ‘try to P’ constructions, and we propose that zero result forms also contain it as well, ensuring that the result need not obtain (though it might) and deriving all of the interpretive facts we have discussed so far, plus other facts we discuss below.

First, however, since zero result readings obtain only in active voice, and this seems to be a fundamentally grammatical constraint, something about Korean active forms must be what introduces this meaning, although given that we have a lexical ambiguity between zero result and result readings it must be optional. The simplest analysis is that it is optionally introduced by the (null) active voice inflection itself, i.e. active voice is polysemous between a form that does not introduce a modality and one that does. In particular, we assume that the non-modal active voice is the identity function that preserves the argument structure and meaning of the verb it inflects (and applies to any verb of any type, including but not limited to caused change-of-state predicates):

\[ [-\emptyset_{\text{active}}] = \lambda P[P] \]

Applying (45) to (44a) derives (46a), and inflecting for tense and declarative force (the semantic of which we ignore here) and applying (46a) to a patient as in (46b) we derive the VP in (46c).

\[
(46) \quad \text{a. } [\text{yel-} \emptyset_{\text{active}}] = \lambda y \lambda v \exists s \exists d [\text{cause}'(v, s) \land \text{patient}'(y, s) \land \text{open}'(s, d)] \\
\text{b. } [\text{changmwn-ul}] = \text{window}' \\
\text{c. } [\text{changmwn-ul yel-} \emptyset_{\text{active}} \text{-ess-ta}] = \lambda v \exists s \exists d [\text{cause}'(v, s) \land \text{patient}'(\text{window}', s) \land \text{open}'(s, d)]
\]

The generalized quantifier form of the subject in (44c) is required, just as in English, deriving (47) once it is applied to the VP in (46c).

\[
(47) \quad [\text{John-i changmwn-ul yel-} \emptyset_{\text{active}} \text{-ess-ta}] = \exists v [\text{effector}'(\text{john}', v) \land \exists s \exists d [\text{cause}'(v, s) \land \text{patient}'(\text{window}', s) \land \text{open}'(s, d)]]
\]

This meaning is essentially identical to its English counterpart.

Conversely, we propose a second, modal active voice that introduces a universal modality over intention sets \( I_x \) for (intuitive) subject referent \( x \), which we notate \( \Box I_x \). That the intentions involved must be those of the intuitive referent \( x \) of the grammatical subject follows from the explicit restriction of the modal base to \( x \)'s intentions, disallowing transfer of intentions to another referent, something that extends to \( P uyto-ka iss\)- and \( P nolyekha\)- constructions as well, all as discussed in

\(^{15}\) More generally, the modal operator we are positing may simply be the operator Grano (2017: 589, (4)) says is the meaning of English intend, which incorporates many if not all of the semantic elements we have discussed above plus more, though we leave making a detailed case for this for future work.
Section 4.2. Furthermore, recall that zero result readings of caused change-of-state verbs disallow inanimate subjects, a property they also share with P uyto-ka iss- and P nolyekha- constructions. That this constraint is shared across all three constructions suggests again that it comes from more general conditions on the modal itself. The simplest analysis is that the modal requires its modal base to be non-empty, which would force the subject to have intentions, thus banning inanimates. This makes intuitive functional sense: since the function of P uyto-ka iss- and P nolyekha- constructions is to describe subject intentions regardless of outcome, a constraint on having intentions would be a reasonable condition on such constructions. If zero result readings are based on the same modal the constraint would thus hold of them as well; we return to this in Section 5.6.

Finally, since the modal base is restricted to the actual individual that serves as the effector of v and thus \( I_x \) must have access to that individual, we assume modalized active inflection itself introduces the causer argument.\(^{16}\) Putting the pieces together, we have the following denotation:\(^{17}\)

\[
\llbracket \neg I_{\text{active-modal}} \rrbracket = \lambda P \lambda y \lambda x \exists v [\text{effector}'(x, v) \land I_x P(y, v)]
\]

(Condition: \( I_x \neq \emptyset \))

Note that the modal only scopes over the caused change, but not the causing event; this will be relevant below. Applying (48) to the verb meaning in (44a) derives (49a), which, when further inflected for tense and declarative force and applied to the patient in (46b) derives the VP in (49b).

\[
\begin{align*}
\text{(49a)} & \quad \llbracket \text{yel-} I_{\text{active-modal}} \rrbracket = \\
& \quad \lambda y \lambda x \exists v [\text{effector}'(x, v) \land \neg I_x \exists d[\text{cause}'(v, s) \land \text{open}'(s, d)]]
\end{align*}
\]

\[
\begin{align*}
\text{(49b)} & \quad \llbracket \text{changmwun-ul yel-} I_{\text{active-modal-ess-ta}} \rrbracket = \\
& \quad \lambda x \exists v [\text{effector}'(x, v) \land \neg I_x \exists d[\text{cause}'(v, s) \land \text{patient}'(\text{window}', s) \land \text{open}'(s, d)]]
\end{align*}
\]

Applying (49b) to the basic subject meaning in (44b) yields (50).

\[
\begin{align*}
\llbracket \text{John-i changmwun-ul yel-} I_{\text{active-modal-ess-ta}} \rrbracket = \\
& \quad \exists v [\text{effector}'(\text{john}', v) \land \neg I_{\text{john}} \exists d[\text{cause}'(v, s) \land \text{patient}'(\text{window}', s) \land \text{open}'(s, d)]]
\end{align*}
\]

The two distinct analysis in (47) and (50) thus derive a systematic ambiguity for active caused change-of-state predicates, and, we suggest, predict all the interpretive properties of culmination and non-culmination interpretations of caused change-of-state predicates with animate subjects.

\(^{16}\)This analysis does have the consequence that, unlike English, intuitively individual-denoting subjects of Korean caused change-of-state verbs are not type-theoretically uniform: sometimes they denote individuals and sometimes generalized quantifiers. However, these are again in complementary distribution, the former only occurring with modalized verbs and the latter with non-modalized verbs. Furthermore, we assume this ambiguity largely for formal convenience. There are other ways to accomplish the same effects, e.g. a reviewer suggests a three-way active voice ambiguity between two active voices for caused change-of-state verbs that introduce an individual effector, one modalized and one not, plus the unmarked active for all other cases. This would capture the same, though it would posit more active voices and also require positing an active voice ambiguity in English, with less motivation. The larger point is that we are not committed to subject ambiguity for caused change-of-state verbs, and nothing critical hinges on it.

\(^{17}\)Owing to type-theoretic constraints (taking a verb that takes an event subject and an individual object) (48) will also only apply to caused change-of-state verbs. However, it may not be just caused change-of-state verbs that allow zero result readings. Some intransitive verbs in Korean, including verbs of motion, arguably have subjects that are agents acting on themselves to change their own state, and these may also admit zero result readings (see e.g. J. Lee 2016b for discussion). We do not discuss these here, but assuming those verbs are also treated as lexically taking evventive subjects then a simple extension of (48) omitting the object argument would apply to such intransitive verbs:

\[
\begin{align*}
\text{(i)} \quad \llbracket \neg I_{\text{active-modal-itr}} \rrbracket = & \quad \lambda P \lambda x \exists v [\text{effector}'(x, v) \land \neg I_x P(v)]
\end{align*}
\]

(Condition: \( I_x \neq \emptyset \))
In particular, intentional zero result readings arise from a meaning like (50): provided the sentence-level evaluation world \( w \) (e.g. \( w_0 \) in realis mood) is not contained in \( I_x \), then the result will not be entailed to have occurred at \( w \), but intentionality necessarily will be entailed due to the modal operator. Non-intentional readings require (47), but the result must obtain at \( w \), so either partial result or culmination must be entailed, the difference just being in how specific an interpretation \( d \) receives owing to conventional meaning and context. The degree to which Korean more freely allows non-quantized readings than in English, the availability of partial result readings may thus hinge on language-particular factors regarding how scalar standards are set, e.g. in Korean preferences for assuming maximal values on closed scales may be weaker than in English and fewer verbs may lexicalize highly specific results. Intentional culmination readings, though, in principle arise from two sources. Nothing precludes (50) from occurring in a context in which \( w \) is in \( I_x \), from which it will follow then that the result obtains at \( w \). Similarly, nothing in (47) precludes that the agent may have acted intentionally, and thus an intentional culmination interpretation is possible in context for this predicate as well. Crucially, though, in both (47) and (50) the causing action itself always occurs at \( w \), predicting that at least some event must occur.\(^{18}\)

An alternative analysis adopted from Martin and Schäfer (2017: 99–102) on French and German offer verbs might take it that there is instead a single voice inflection with a single modality, which they label as the “causal success” modality, which may or may not include \( w \) and thus does not require culmination. Pragmatic factors partly contingent on subject animacy determine whether \( w \) is in the modal base as per Martin (2015), who argues that agent subjects more easily suggest that the causing eventuality indicates and sustains a possible result since they often have goals and their potentially causing actions are more clearly delineated. However, while this may be right, there is still necessary intentionality with animate subjects when zero result arises in Korean, and no evidence that zero result is possible at all with inanimates. So even if a causal success modal base is somehow involved in all active forms, something like the analysis we propose here is nonetheless still necessary above and beyond it. To put it another way, the Korean data seem to be more narrowly constrained in terms of modality than in (say) French for both types of subjects.

Furthermore, the analysis we propose derives directly that the causal event \( v \) must be direct by virtue of the cause' operator of the lexical caused change-of-state event structure (even if the result does not also obtain at \( w \); see Section 4.1). Direct causation is a commonly attested property of lexical caused change-of-state predicates (see e.g. Dowty 1979: 96–98; Shibatani and Pardeshi 2001: 86–91), and thus comes for free from the event structure of the verb regardless of the presence of the modality. This also explains why the constraints of zero-result readings are stronger than those of “try to P” constructions, since (following Sharvit 2003 or Grano 2011) those simply require some (contextually sufficient) minimal initial portion of the event to occur, not necessarily that it amount to a direct cause.\(^{19}\) Alternatively, Martin (2015: 255–256) explains the relative directness of causation in zero result readings in French by hypothesizing that zero result is only licensed if the causing eventuality strongly indicates the outcome, i.e. it must be “more than a try”. However, on the approach we have adopted here no such extra condition is needed: lexical cause’ is the only

\(^{18}\)One question is why a lexical passive like mac- ‘be beaten’ cannot take the modal active inflection and thus allow a zero result reading (as per Section 4.3). Here we assume that lexical passives are already inflected for voice in the lexicon and thus do not take voice morphology.

\(^{19}\)That said, many caused change-of-state verbs do not place many constraints on what can count as a causing event, so what may occur could in context be rather minimal (see e.g. Koontz-Garboden 2009: 84–85). The key point is that some actual attempted direct causation is entailed to occur at \( w \).
causal relation in the predicate, and it already ensures relatively direct causation with no further stipulation. Thus the underlying event structure plus the scope of the sublexical modality ensures a (potentially) direct causing eventuality always occurs, even if the result does not (though it may).

Still further, localizing the source of the ambiguity in the active voice inflection is motivated not just by the fact that it only occurs in these forms; it is also compatible with the ellipsis ambiguity diagnostic in Section 3.4. The VP-ellipsis form kulay- ‘do so’ is voice neutral and takes its voice from its antecedent, so that the minimal unit it indicates the ellipsis of includes voice:

    Jane-NOM book-ACC burn-CAUS-PST-and Max-also do-so-PST-DECL
    ‘Jane burned a book and so did Max.’ (=23)

   b. chayk-i thay-wu-e ci-ess-ta. kuliko chayksang-to kulay-ss-ta.
    book-NOM burn-CAUS-COMP PASS-PST-DECL and desk-also do-so-PST-DECL
    (lit.) ‘The book was burned. And so did the desk.’
    = ‘The book was burned. And the desk was also burned.’

Thus this analysis explains the ellipsis facts in Section 3.4. Finally, this analysis is consistent with the analysis of Bar-el et al. (2005) for the Stʼatʼimcets and Skwxwú7mesh, where overtly inflected “control transitive” forms of caused change-of-state predicates are those that give rise to non-culmination (in that case both zero and partial result), suggesting that the locus of that interpretation is the inflection itself. Though in Stʼatʼimcets and Skwxwú7mesh the form allowing non-culmination is overtly marked, the Korean data are parallel in that non-culmination is limited to a specific verbal subcategory (active voice), suggesting a parallel analysis is warranted despite the lack of overt marking (see Demirdache and Martin 2015: 211–2012 for related discussion). We turn next to inanimate subjects.20

5.6 Korean caused change-of-state predicates: inanimate subjects

Consider cases where the subject is not animate – either it is an inanimate individual, an event, or a state, as in (52a-c) respectively.

(52) a. [chentwung-i] = λP∃v[effector′(thunder′, v) ∧ P(v)]
   b. [Julia-uy pwucwuuy-ka] = julia′s-negligence′
   c. [Minji-uy hayngtong-i] = minji′s-action′

Combining the verb+object meaning in (46c) with these three subjects yields (53).

(53) a. [chentwung-i changmwun-ul yel-0active-ess-ta] =
    ∃v[effector′(thunder′, v) ∧ ∃s∃d[cause′(v, s) ∧ patient′(window′, s) ∧ open′(s, d)]]
   b. [Julia-uy pwucwuuy-ka changmwun-ul yel-0active-ess-ta] =
    ∃s∃d[cause′(julia′s-negligence′, s) ∧ patient′(window′, s) ∧ open′(s, d)]

20A reviewer also notes that the analysis we are proposing may be able to account for mistaken agents as discussed in Section 3.3 with minimal fuss. In particular, since the intentional modal operator is introduced by voice it is reasonable to assume that modifiers like silswulo ‘accidentally/by mistake’ generally outscope it by default. If object DPs may also raise out of the scope of the intentional modal operator (e.g. via Quantifier Raising) this could generate a de re but not de dicto intention for the agent to cause a change-of-state in the patient, with silswulo indicating just mistaken identity, as essentially outlined in Martin (2016: 5). We leave the details of this analysis for future work.
c. \[ [\text{Minji-uy hayntong-i changmwun-ul yel-} \psi_{\text{active-ess-ta}}] = \exists s \exists d (\text{cause}'(\text{minji's-action}', s) \land \text{patient}'(\text{window}', s) \land \text{open}'(s, d)) \]

Given that there is no intentionality modal, the result must obtain at \( w \), partially or completely. Crucially, though, in no case is the modalized active voice version of the VP in (50) possible. With event and state subjects there is a type conflict between this form of the verb, which requires an individual subject, and the type of those two subjects, which are eventualities. In the case of inanimate individuals there is no type conflict, assuming a noun like \text{chentwung-i} has a standard direct reference use denoting \text{thunder}' as well. But since inanimates lack intentions, \( I_x \) would be empty, conflicting with the requirement in (48) that \( I_x \) not be empty. Intuitively, in both cases the explanation is essentially the same: these are types of entities that lack intentions, and thus cannot be the subject of the verb form that requires intentionality. Thus the only possible form of the verb that can be used with inanimates is the non-modal version, and thus the result must always obtain at \( w \). Taken together, these facts rule out zero result interpretations with inanimate subjects. In the next two sections we discuss additional predictions of this analysis that suggest its correctness.

### 5.7 Additional predicted readings

Above the combination of a modal analysis and a scalar analysis derives the canonical zero result, partial result, and culmination readings. However, the analysis also makes additional predictions about the interaction of the degree semantics and the modality that further support it. First, on the modal reading the analysis leaves open whether the result that obtains in the worlds in \( I_x \) is complete, i.e. the value of \( d \). The prediction then is that the agent may in particular contexts intend partial result rather than culmination. That this is possible is demonstrated by the following, where context clarifies that the agent had in mind only a partial result, though no actual result obtained:

(54) [ John intended to build only half of the house. ]

\[
\begin{array}{cccc}
\text{John-i} & \text{cip-ul} & \text{ci-ess-ciman,} & \text{cip-i} \\
\text{NOM} & \text{ACC} & \text{build-PST} & \text{but house-NOM}\end{array}
\]

\( \text{cenhye ci-e ci-ci anh-ass-ta.} \)

\( \text{NEG-PST-DECL} \)

(lit.) 'John built a house, but a house was not built at all.'

Of course, there is an alternative analysis, namely that in context "complete" success is defined by a value of the degree of the final state \( d \) that is less than what would canonically be considered the maximum, and thus the reading is technically zero result of a complete change. However, it is also possible that the agent’s only goal is some change, with no particular change intended:

(55) [ John intended to cool the soup, but had no particular final temperature in mind. However, he was unable to achieve this. ]

\[
\begin{array}{cccc}
\text{Jane-i} & \text{suphu-lul} & \text{sik-hi-ess-ta.} \\
\text{NOM} & \text{ACC} & \text{causal-cool-PST-DECL} \end{array}
\]

\( \text{Jane-cooled the soup.} \)

This suggests that zero result interpretations are not necessarily fixed to any particular degree \textit{per se}, admitting zero result of intended partial result, exactly as predicted by the analysis we propose above. Of course, as noted above, the default reading of change may differ verb-to-verb owing to a range of factors, and this may figure into how easy it is to get intended partial result and what sorts of contexts support it. But the fact that such readings exist at all supports the analysis here.
Second, the analysis predicts that in non-modal contexts partial result should still be possible even with inanimate subjects (consistent with cross-linguistic observations also in Demirdache and Martin 2015: 198–199 and Martin and Schäfer 2017: 92). Crucially, this prediction is borne out:

(56) a. \[
\text{kangha-n} \text{palam-i namwu-lul ppop-ase namwu-ka cokum/wancenhi} \\
\text{strong-REL wind-NOM tree-ACC pull-out-so tree-NOM a,little/completely} \\
\text{ppop-hi-ess-ta.}\\
\text{pull_out-PASS-PST-DECL}\\
\text{‘The strong wind pulled out the tree, so it was a little/completely pulled out.’}
\]

b. \[
\text{cha-n palam-i suphu-lul sik-hi-ese suphu-kay cokum/wancenhi} \\
\text{strong-REL wind-NOM soup-ACC cool-CUS-since soup-NOM a,little/completely} \\
\text{sik-ess-ta.}\\
\text{cool-PST-DECL}\\
\text{‘Since the cold wind cooled the soup, it cooled a little/completely.’}
\]

Similarly, partial result is also possible in passive voice, which on the analysis we are proposing does not contribute the relevant modal operator and thus (a) at least some result should arise albeit not necessarily a complete result, and (b) intentionality of the subject referent should not be a requirement of the interpretation and thus there should be no ban on inanimates as subjects:

(57) a. \[
\text{namwu-ka (cokum/wancenhi) ppop-hi-ess-ta.}\\
\text{tree-NOM a,little/completely pull_out-PASS-PST-DECL}\\
\text{‘The tree was pulled out (a little/completely).’}
\]

b. \[
\text{suphu-ka (cokum/wancenhi) sik-hi-e ci-ess-ta.}\\
\text{soup-NOM a,little/completely cool-CUS-CMP PASS-PST-DECL}\\
\text{‘The soup was cooled (a little/completely).’}
\]

In sum, admixtures of zero and partial result readings are possible, and partial result readings admit a wider range of subjects than zero result, all of which are predicted on the account above.

Finally, under the ambiguity proposed above the semantically unmarked form of any caused change-of-state predicate will be the non-modalized one, correctly predicting that absent supporting context to the contrary the default interpretation of any caused change-of-state predicate should be a partial result or culmination reading (with the difference between these arising from other factors, as noted above). This differs from \text{P nolyekha-} ‘P try’ “try to P” constructions, where the default reading in Korean is fairly neutral as to the coming about of the result, though as noted by Martin (2015: 249, fn.4) in some languages “try to P” constructions instead implicate by default that the result did not come about. However, this difference is expected: \text{P nolyekha-} constructions are not ambiguous in the same way and are always neutral to the outcome, thus the default reading would be predicted to either be neutral or possibly to generate an implicature of zero result given that there are (less marked) alternative means for expressing an actual result. We turn next to a still further prediction of our analysis beyond lexical caused change-of-state predicates.

5.8 A further prediction: derived caused change-of-state predicates

The data above suggest that zero result readings vs. partial result and culmination readings arises from a systematic ambiguity. This is unlike the proposal for French and German offer verbs in Martin and Schäfer (2012), for which they posit a single lexical item covering all readings, and
like the analysis of non-culmination of Karachay-Balkar in Tatevosov (2008), who posits ambiguity. However, a key difference between Tatevosov’s analysis and ours is that Tatevosov’s analysis attributes the systematic ambiguity to the surface verbal root itself, or more specifically in the Ramchand (2008)-style syntactic event decomposition he assumes that surface verbal root is broken down into a theoretical (acategorial) root composed with various event-denoting v heads representing basic event templatic predicates, and some of these are ambiguous between readings with and without a modal operator. The key point though is that the ambiguity is below and thus independent of voice. In Korean our claim is that the active voice inflection is responsible for the ambiguity. While we do not know the full facts of Karachay-Balkar, in Korean at least there is an additional prediction of our analysis that suggests it is preferred over a surface lexical root ambiguity analysis. In particular, zero result readings are not exclusive to lexical caused change-of-state predicates. Rather, they are also possible with a range of derived caused change-of-state predicates, provided those predicates are once again in the active voice. These include (among others) caused change-of-state predicates derived from overt causativization of an underlying inchoative (as in fact occurred in a few of our earlier examples) and light verb constructions formed from a nominal root contributing a caused change-of-state event and a light verb hay- ‘do’, which also admit zero result readings in active (but not passive) voice with intentionality as a requirement (see J. Lee 2015: 116–214 for extensive additional discussion of these types of predicates). In particular, for the morphological causative in (58a) or the light verb construction in (58b) explicitly denying the result is non-contradictory with asserting that an event of the sort described by the change-of-state predicate occurred, though here modifiers indicating non-intentionality are impossible (save on a mistaken identity reading, which we have set aside; see Section 3.3), all of which are properties of zero result readings for lexical caused change-of-state predicates.

Julia-NOM book-ACC unintentionally/by mistake burn-CAUS-PST-DECL but
chayk-i acik kutaylo-yess-ta.
book-NOM yet same-PST-DECL
(lit.) ‘Julia burned the book (unintentionally/by mistake). But it was still the same.’

b. ku-ka kenmwul-ul (#uytohacianhkey/#silswulo) phakoy-hay-ss-ta. kulena
he-NOM building-ACC unintentionally/by mistake destroying-do-PST-DECL but
building-NOM at all destroying-PASS-COMP NEG-PST-DECL
(lit.) ‘He (unintentionally/by mistake) did destroying of the building. But it was not destroyed at all.’

If the event structures deriving zero result readings are lexicalized it is difficult to see how that reading would arise from a surface root ambiguity in cases like (58) since the roots in each case (verbal or nominal) do not themselves necessarily show such an ambiguity independently. That said, if the syntactic event structures assumed by Tatevosov (2008) were extended to causatives and light verb constructions it would follow that they should allow the same ambiguity as lexical predicates, but it also nonetheless still predicts that this should be independent of voice. It is an empirical question, but in Korean at least it is clear that localizing the modality in the voice inflection predicts that the broader class of active caused change-of-state predicates will allow zero result regardless of their lexical or derived nature. We summarize our results next and discuss some of its potential broader ramifications.
6 Conclusion and consequences

Korean caused change-of-state predicates, as in many other languages, show interpretations other than culmination readings, including zero result and partial result readings. But as we have argued here, partial result and culmination readings are essentially two subspecies of the same reading, reflecting non-quantized and quantized change interpretations respectively. Zero result interpretations, however, seem to be a wholly different beast. In particular, these readings occur only in active voice variants and furthermore require that the subject be a causer who intends the result to obtain by direct causation. This reading is distinct from the other two readings in a way suggestive of a real ambiguity, which we argue is localized in active voice in Korean, correctly predicting its broad applicability to derived predicates with caused change-of-state event structures plus also that it would show significant interactions with zero result and partial result interpretations. That the event structure deriving non-culmination is otherwise parasitic on the lexical event structures typical of caused change-of-state predicates explains why the causation – realized or not – must be direct.

We conclude by discussing some ramifications of this analysis. First, the modal base is clearly that of intentionality – zero result readings absolutely require subject intentions. Other works on non-culmination that have employed a modal analysis have utilized different modalities, and Martin and Schäfer (2012: 252–256) in particular provide a clear argument that in French and German intentionality is not the right analysis for offer verbs, since there are certain uses where zero result readings arise but the subject did not intend the result. One example would be if the subject is inanimate but the non-occurrence of the result is unexpected from the speaker’s perspective:

(59) *Ces circonstances lui ont offert un super job; et pourtant, contre toute attente, elle ne l’a pas pris.*

‘These circumstances offered her a great job; and nevertheless, against all expectations, she didn’t take it.’

(French)

(based on Martin and Schäfer 2012: 254, (15), glosses ours)

Such readings are not possible at all in Korean, e.g. in the following even if the wind is incredibly strong and it is inconceivable that it did not open the window the sentence is unacceptable:


‘The strong wind opened the window. But the window was not opened.’

This suggests that while modality-rooted non-culmination may exist as a general phenomenon across languages there is language particular parameterization of the relevant modal base. A question though is what types of modal bases may occur in different languages, and why some languages would have one type of modal base and not another. This is something that at the moment we do not have an answer for, though as a reviewer notes certain types of modal bases (e.g. those having to do with beliefs) may not be appropriate for zero result readings since they are not fundamentally event-oriented. Second, in French and German offer verbs it is actually possible to pick up on the expectations of an implicit agent that is not overtly expressed in the clause, while in Korean
there seems to be a strong grammatical constraint that the intentions must be associated with the intuitive referent of the grammatical subject (in an active clause), as discussed in Sections 4.2-4.3. This suggests further parameterization of non-culmination interpretations: they may be subject to distinct grammatical constraints across languages. Third, the evidence in Korean is clearly suggestive of an actual ambiguity, which our analysis captures. But some prior analyses of different types of non-culmination (e.g. Martin and Schäfer 2017, though see also Piñón 2014) have posited accounts rooted in vagueness instead. This is another potential point of variation across languages.

Fourth, while the evidence does suggest an ambiguity between zero result and non-zero result readings, the ambiguity does not appear to be in the lexical root but rather in voice. Yet many prior modality-based analyses of other languages have tended to posit the modal operator in the basic lexical event structure (e.g. Koenig and Muansuwan 2000; Tatevosov 2008), though one exception is found in Bar-el et al. (2005) for St’át’imcets and Sḵwx̱wú7mesh, where it is the control transitive forms that allow non-culmination. Taken together, this all suggests additional grammatical parameterization in what may be the locus of such readings – basic lexical aspect, voice, or something language particular (see also Koenig et al. 2016). That said, a reviewer asks why such readings would be restricted to active voice in Korean, wondering if it has a grammatical explanation having to do with, say, the specific base position of the subjects of actives vs. passives (e.g. Spec,vP vs. Spec,VP) or possibly with the pragmatics of passives as focusing on a result and thus requiring there to be a result to focus on. It is difficult to know exactly why there should be a restriction of zero result readings to active voice, and it is not something we are able to address here. But if it has something to do with a deeper difference between active and passive voice such as subject position or a pragmatic contrast we would expect the effect of voice to recur in other languages as well, assuming that these more basic differences are cross-linguistically attested. Should other languages not exhibit the same contrast, or should there be cross-linguistic variation in this without a concomitant syntactic or pragmatic difference in how different voices contrast in other languages, then the restriction may well just be an idiosyncratic fact about Korean.

Finally, we turn to the Agent Control Hypothesis (ACH) of Demirdache and Martin (2015: 201, (20b)), which states (on its weaker form, which applies to all languages they examine) that “[zero result] construals only require the predicate’s external argument to be associated with ‘agenthood’ properties.” Do the Korean data support the ACH? Clearly what is meant by “control” cannot be literal control, e.g. how likely the agent is to actually effect the change or how much control the agent has over the event (see e.g. Jacobs 2011). If it did, the prediction would be that in a context where an agent is utterly doomed to fail zero result should not be possible. However, this turns out not to be the case. In (61) context makes clear the agent will fail, and yet zero result is fine.

(61) [ The steel door is heavy, and it can be opened only by pushing it. It is very difficult for Mary to open it, but Mary pushed the door to open it anyway.]
Mary-NOM door-ACC open-PST-but door-NOM open-PASS-COMP NEG-PST-DECL.
(lit.) ‘Mary opened the door, but it was not opened.’

Rather, as we have argued extensively above, the key constraint is that the agent intends – and in particular believes – that the result can be obtained by the contextually defined action, not that the agent is necessarily sure of success. If “control” more broadly means having “agenthood” properties (as in the definition itself rather than the name of the ACH), Korean does seem to instantiate the ACH: intentionality is strongly correlated with agentivity (e.g. Dowty 1991: 572, (27) lists
closely related volitionality in his proto-agent properties) and is required for zero result in Korean. Thus taking this definition of what “control” means, Korean further supports the idea that there are cross-linguistic universal principles about zero result interpretations along the lines of the ACH, even if the data above suggest more nuanced parameterization of how this principle is manifested across languages. An open question, then, is what other language-particular constraints on agentivity in zero result readings are possible? Martin (2016) (building on Martin 2015) defines several classes of agents, including not just typical agents (e.g. “full agents” in her terminology) but also four types of atypical agents, including some of those discussed above, namely mistaken agents, absent-minded agents, and accidental agents, plus externally-assisted agents (agents who are only successful owing to helping external factors, not discussed above). She notes that only full agents, mistaken agents, and absent-minded agents readily license zero result readings in the various languages she examines, with some cross-linguistic variation. In Korean this is generally true though the constraints on zero-result readings seem fairly specific – intention is the necessary, key component, and this derives the generalization. But different languages could derive this generalization through different means. What variation exists across languages in instantiating the ACH is a significant question for future research.

References


Buffalo, State University of New York.
Martin, Fabienne. 2015. Explaining the link between agentivity and non-culminating causation. In Sarah D’Antonio, Mary Moroney & Carol-Rose Little (eds.), *Semantics and linguistic theory (SALT)*, vol. 25, 246–266. LSA and CLC Publications.


