Two types of inference in evidentials: Efficacy vs. doxastic worlds[1]

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Abstract. In this paper we propose that Korean evidential *-te-* requires the inference from directly perceived evidence, and this inference should be based on efficacy (Copley and Harley, 2015). Then we show that this proposal can explain the apparent variable evidentiality of *-te-* between direct evidentiality and inferential evidentiality (Chung, 2007; Lee 2013; a.o.) without assuming relative tense (Lee, 2013; Smirnova, 2013; Koev, 2017; a.o.). We also argue that this proposal can easily account for the differences between *-te-* and other closely related categories such as epistemic modals and predictive futures. In addition to this, given that *-te-* introduces the speaker's weak commitment due to its inference, we try to explain this weak commitment in terms of the scoreboard semantics (Farkas and Bruce, 2010; Malamud and Stephenson, 2015; a.o.). We also discuss the implication of our proposal, especially with respect to the typology of evidentials.

Keywords: Korean evidential *-te-*, direct evidentiality, inferential evidentiality, efficacy condition, weak commitment

1. Introduction

This paper deals with two unique characteristics of Korean direct perceptive evidential *-te-*. The first characteristic is what we call the 'variable evidentiality' of *-te-*. *-te-* has been said to introduce two different types of evidential implications. When it is used without any overt tense it introduces the implication that the speaker directly perceived the event denoted by the prejacent (hereafter *direct evidentiality*). In contrast, when it is used with the overt tense *-ess-*, it introduces the implication that the speaker infers the event denoted by the prejacent based on her direct perceptive evidence (hereafter *inferential evidentiality*). For example, (1a), where there is *-te-* without any overt tense, carries the implication that the speaker perceived the pouring rain, whereas (1b), where *-te-* appears with the past tense *-ess-*, carries the implication that the speaker infers that it rained before from her perceived evidence such as the wet ground.

(1) a. *Pi-ka   o-te-la.*
         rain-NOM   come-*te*-DECL
         'It is raining.'
         (Implication: the speaker directly perceived the pouring rain)
     b. *Pi-ka   o-ass-te-la*
         rain-NOM   come-PST-*te*-DECL
         'It rained.'
         (Implication: from perceived evidence such as the wet ground, the speaker infers that it rained)

The second characteristic concerns the temporal interpretation of the sentence containing *-te-*, and to introduce this, let us define three time intervals or time points relevant to the interpretation of evidentials (see Lee, 2013; Koev, 2017; a.o.). First, there is the *utterance time* (UT), or the time when the speaker's utterance occurs. Second, there is the time when the event denoted by the prejacent occurs, which we call the *event time* (ET). Finally, there is the time when the speaker acquires the evidence via her direct perception, which we would like to call the *learning time* (LT). The reason why we require LT, besides ET and UT, is that, as pointed out in a lot of previous studies (Chung, 2007; Lee, 2013; a.o.), *-te-* has the temporal constraint that LT should precede UT: the speaker can employ *-te-* only after she perceived the evidence. When LT overlaps with UT, *-te-* becomes infelicitous. For example, when the speaker is looking at the pouring rain, she cannot utter (1a), and similarly, when the speaker is looking at the wet ground, she cannot utter (1b).

The aim of the present paper is to propose an explanation of these two characteristics, or, this paper tries to answer the following three questions. First, how can we explain the variable evidentiality of *-te-*? Specifically, given that the variable evidentiality itself can be found across various languages (e.g., see Smirnova, 2013; Koev, 2017 for the variable evidentiality of Bulgarian evidential *-l*), how is the variable evidentiality introduced by *-te-* different from that of evidentials in other languages such as Bulgarian *-l*, and how can this difference be explained? Second, what is the relation between the variable evidentiality of *-te-* and the temporal restriction of *-te-* that LT should precede UT? Finally, what is the typological implication of the semantics and pragmatics of Korean *-te-*?

To answer these questions, we first give an overview of some previous theories which can be a candidate for a proper analysis of *-te-*, and show that they cannot fully account for unique characteristics of *-te-* (Section 2). We argue that *-te-* can neither be accounted for in terms of modals-*te-* nor can it be explained by assuming relative tense. Next, we make our own proposal, arguing that *-te-* is an evidential which requires inference from direct evidence, and its inference should be based on what Copley and Harley (2015) call the 'efficacy condition' (Section 3). Then we discuss one implication of our proposal, that is the weak commitment involved with *-te-*, and analyze this weakness in terms of scoreboard semantics (Farkas and Bruce, 2010; Malamud and Stephenson, 2015; a.o.) (Section 4). Finally, we conclude our paper and discuss further implications of our proposal (Section 5).

2. Previous theories and their problems with respect to *-te-*

As we will see below, one of our main proposals is that *-te-* always introduces some kind of inference, even when it appears to introduce direct evidentiality. In this section discuss some previous theories on inferential evidentiality, and compare the inference triggered by *-te-* with that triggered by other grammatical categories, especially (epistemic) modals.

2.1. *-te-* is not a kernel-based epistemic modal

Modals, especially epistemic modals, are one of the grammatical categories that have been discussed in relation to evidentials. Given this, we may try to analyze *-te-* in terms of epistemic

modals, as Lee (2013) already did. As an alternative, however, we will adopt von Fintel and Gillies's (vF&G) (2010) notion of kernel to analyze *-te-*.

According to vF&G, *must* is an epistemic modal, but it introduces the presupposition that the speaker should have indirect evidence regarding the prejacent. To formalize this intuition, vF&G introduce the notion of kernel. According to them, kernel reflects the speaker's directly perceived evidence, [2] and *must φ* is felicitous only when the kernel cannot directly decide, or settle, whether *φ* is true or not *φ* is true, see (2)-(4). For example, (5a) cannot be felicitously uttered based on a kernel like (5b). Since the speaker is assumed to have direct evidence that it is raining, the proposition *that it is raining* should be involved in the kernel, which directly settles the issue of whether it is raining or not. In contrast, (5a) becomes felicitous based on (5c). The kernel in (5c) can be derived only if the speaker just perceived the wet rain gear. Given the proper indirect evidence, (5a) can be felicitously uttered.

(2)   Kernel K: the set of propositions representing the directly perceived evidence

(3)   Fix a c-relevant kernel K:
       i. $\llbracket \textit{must } \varphi \rrbracket^{c,w}$ is defined only if K does not directly settle $\llbracket \varphi \rrbracket^c$
       ii. $\llbracket \textit{must } \varphi \rrbracket^{c,w} = 1$ iff $B_K \subseteq \llbracket \varphi \rrbracket^c$ (von Fintel and Gillies, 2010: 372)

(4) K directly settles whether P iff either $X \subseteq P$ or $X \cap P = \varnothing$ for some $X \in K$
                                                              (von Fintel and Gillies, 2010: 374)

(5)   a.   It must be raining.
       b. K_1 = {it is raining outside, …}
       c. K_2 = {there is rain gear, if the rain gear is wet then it is raining, …}

Matthewson (2015) tries to impose constraints on the kernel to explain various types of evidentials as well as epistemic modals. If we apply this to Korean *-te-*, one possible analysis would be to assume that *-te-* is an epistemic modal, and the kernel of *-te-* includes the set of propositions consisting of the speaker's direct perceptive evidence.

However, the problem is that, with *-te-*, as pointed out in the introduction, LT should precede UT. To see why this characteristic is problematic for the kernel-based analysis, consider (1) again, repeated below as (6).

(6)   a.   *Pi-ka   o-te-la.*
             rain-NOM   come-*te*-DECL
             'It is raining.'
             (Implication: the speaker directly perceived the pouring rain)

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[2] vF&G's (2010: 371) definition of a kernel is more complicated: "kernels represent what information is direct information in the context – or direct enough in the context, since what counts as direct may well depend on context." Here we simplify this definition for our purpose.

b.　*Pi-ka　　　o-ass-te-la.*
　　　rain-NOM　　come-PST-*te*-DECL
　　　'It rained.'
　　　(Implication: from perceived evidence such as the wet ground, the speaker
　　　infers that it rained)

Consider (6a) first. If (6a) introduces direct perceptive evidentiality, its kernel would be like (7a), and if (6a) introduced inferential evidentiality, its kernel would be like (7b). However, given that LT should precede UT, no matter what kind of kernel is assumed, (6a) becomes unacceptable when LT overlaps with UT.

(7)　a.　Evidence: the speaker is seeing the pouring rain
　　　　　→ K = {it's raining, … }
　　　b.　Evidence: the speaker is seeing wet rain gear
　　　　　→ K = {there is rain gear, if the rain gear is wet then it's raining, ….}

Similarly, since (6b) introduces inferential evidentiality, the kernel would be like (8), but again, when LT overlaps with UT, (6b) becomes infelicitous no matter what kind of kernel is assumed.

(8)　Evidence: the speaker is seeing the wet ground.
　　　→ K = {the ground is wet, if it is not raining anymore, it rained, ….}

All of these examples show that the inference triggered by *-te-* cannot be accounted for in terms of the kernel. Furthermore, one should note that the inference of *-te-* is mainly due to its temporal restriction that LT should precede UT: since LT precedes UT, the speaker needs to infer the event at UT from the event she witnessed at LT (before UT) even when she utters a proposition denoting some events at UT. This intuition is further supported by the fact that when employing *-te-* it does not matter how big the temporal gap between LT and UT might be. For example, suppose that the speaker witnessed the raining event at LT, and after 30 minutes, because of the witnessed event, the speaker infers, and is sure, that it is raining at UT. Then, as far as we can see, the speaker can still felicitously use *-te-*. This relation between the temporal restriction on *-te-* and the inference triggered by this restriction is, we believe, what has received little attention in previous literature.[3] Crucially, due to this restriction, we may further posit that in cases like (6a), which apparently introduces direct evidentiality, there is some inference. An adequate theory of *-te-* should account for this kind of inference triggered by LT and its relation with UT.

Before moving on to the next subsection, we need to point out that (6a) cannot be uttered when the speaker does not make any commitment to the prejacent at UT. This means that, in (6a), the speaker *should* make a commitment to the prejacent which holds at UT; and while uttering (6a), from her evidence at LT, the speaker infers the prejacent which holds at UT. That is, (6a), which has been said to introduce direct evidentiality in previous literature, should involve some inference.

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[3] Lee (2013) also notes the temporal restriction that LT should precede UT, but she tries to explain the variable evidentiality in terms of the relative tense theory, and does not pay much attention to the relation between the temporal restriction of *-te-* and the inference triggered by this restriction. See further below.

2.2. *-te-* is not a non-certainty modal

Of course, we may try to analyze *-te-* in terms of other kinds of modals. To see what kind of modals might be relevant, consider the temporal restriction on *-te-*, that is LT should precede UT. Above we pointed out that this temporal restriction triggers an inference from an event at LT to an event at UT, that is a *future* event with respect to LT. This leads us to try to analyze *-te-* in parallel with the so-called 'predictive future' (Ippolito and Farkas, 2019; Mihoc, Bhadra and Fălăuş, 2019; a.o.; see also Giannakidou and Mari, 2018), given that predictive futures also introduce the meaning of presumption.

However, there is a crucial difference between the predictive future and *-te-*: when the speaker is certain about the prejacent, the latter can be used, whereas the former cannot (Mihoc et al., 2019). In fact, *-te-* is used only when the speaker is certain about (and is committed to) the prejacent. To illustrate this point, see (9a), where the speaker is not certain that it is raining at UT due to the weather forecast. In this scenario, (1a), repeated below as (9b), becomes infelicitous. Note that in the same scenario a necessity modal such as *-l kes-* is fine, see (9c):

(9) a.   *Scenario: Leaving her home at 11:50 a.m. to meet her friend Tom at a café, Jane saw that it began to rain outside. At 11:55 a.m., she met Tom at the café, which does not have a window. Soon it became noon. Since there is no window at the café, and Tom already arrived at 11 a.m., he did not know whether it was raining at noon or not. At first, Jane was quite certain that it was raining at noon, given that in that area it usually rains for about one hour, but soon she remembered that a forecast in the morning had said that it would stop raining at noon. Tom was wondering whether it was raining outside, and Jane said…* (adopted and revised from Hoe, Park, Kim and Lee, 2018)

   b.   *#Pi-ka   o-te-la.*
        rain-NOM   come-*te*-DECL
        'It is raining.'

   c.   *Pi-ka   o-ko.iss-ul.ke-ya.*
        rain-NOM   come-PROG-NEC-DECL
        'It must be raining.'

To understand why (9b) is not felicitous, note that (9a) satisfies the temporal constraint on *-te-* that LT should precede UT, and for (9b) to be felicitous, *-te-* should trigger the inference from the raining event at LT to the raining event at UT. Usually this inference need not be canceled by simply listening to the forecast, since the forecast may not be correct. Still, (9b) is not felicitous in the context of (9a), which suggests to us that *-te-* can be used only when the speaker is certain about the prejacent, and this certainty cannot be analyzed in term of the predictive future.

2.3. *-te-* does not involve relative tense

In the previous subsection we pointed out that *-te-* cannot be analyzed in terms of modals. Specifically, we showed that *-te-* triggers some kind of inference even when there is no tense such as the past *-ess-*, and that this inference cannot be explained by simply assuming that *-te-*

is an epistemic modal or a kind of a predictive future. As an alternative, as some authors (Lee, 2013; a.o.), we may try to analyze *-te-* in terms of what we call 'the relative tense theory' (hereafter RT), which was suggested to explain the variable evidentiality of *-te-*. We will briefly summarize the RT, and discuss why it cannot fully explain the inference triggered by *-te-*, either.

According to RT, a tense under evidentials should be evaluated not against UT but against LT. Under this analysis, *-te-* is a direct perceptive evidential, and depending on the relation between ET and LT, *-te-* may introduce either direct or inferential evidentiality. In (1a), ET overlaps with LT: the speaker can directly perceive the event denoted by the prejacent. Here direct evidentiality is introduced, and no overt tense is required. In contrast, in (1b), ET precedes LT, which is indicated by the past tense *-ess-*. Here, since the speaker can only perceive the result of the event, inferential evidentiality is introduced. Note that for (1b) it is assumed that the past tense is anchored to LT, not to UT. This kind of approach is also adopted to analyze Bulgarian evidential past tense *-l*. For example, Koev (2017) tries to analyze *-l* in terms of relative tense and assumes that a tense under *-l* expresses the relation between LT and ET, not between UT and ET.

Here we note that, as pointed out before, when using *-te-* in Korean or *-l* in Bulgarian, the speaker cannot obtain evidence based on pure reasoning. That is why, for example, Smirnova (2013) argues that Bulgarian *-l* simply requires externally experienced evidence. This may explain the variable evidentiality, and may further be applied to Korean *-te-*. However, unlike Bulgarian *-l*, Korean *-te-* cannot introduce hearsay evidentiality. None of our previous Korean examples are felicitous when the speaker only has hearsay evidence, which means that Smirnova's analysis cannot be simply applied to Korean. Furthermore, many analyses of Bulgarian *-l*, including Koev (2017), assume that both inferential and hearsay evidentiality are classified as indirect evidentiality, given that ET precedes LT, but many studies, including AnderBois (2014), point out that hearsay is different from inference. Specifically, AnderBois argues that an evidential can introduce hearsay evidentiality when a pragmatic perspective shift is involved and therefore an animator (or actual speaker) becomes different from a principal (or commitment holder). Now, given this, under RT, it seems unclear why *-te-* cannot introduce hearsay evidentiality. This problem becomes significant when we consider (1b) again, where *-te-* is used with the past tense. Here ET precedes LT, as is the case with *-l*. So there is no reason why (1b) cannot introduce hearsay evidentiality, unlike comparable examples with *-l*. Note that this difference cannot be reduced into the lexical difference: there is no reason why we need to assume that AnderBois's (2014) perspective shift is not possible with *-te-*.

2.4. Interim summary

In this section we showed that previous analyses have problems explaining the inferential characteristics of *-te-*. Specifically, we pointed out that there is some inference even when *-te-* is employed without any tense marker. We further pointed that *-te-*'s inference does not trigger a pragmatic perspective shift (and therefore it cannot introduce hearsay evidentiality). As far as we can see, none of the previous theories, which view evidentials as modals, or as introducing relative tense, can explain the kind of inference made when using *-te-*.

Given this result, there are some immediate questions. If both (1a) and (1b) introduce an inference, what is the nature of these inferences? Can we assume that the two inferences actually have the same characteristics? If the answer to this question is positive, then why does there seem to be variable evidentiality? In the next section, we will try to answer these questions.

3. Proposal and analysis

3.1. Proposal

We propose that we need to reconsider criteria for classifying evidentials. Previous studies on a typology of evidentials, such as Willett (1988) and Aikhenvald (2004), mainly focus on what kind of source of information an evidential introduces, but here we propose two new criteria: whether there is any direct perception or not, and what kind of inference should or should not be involved, as illustrated in (10), see Section 5 for more details:

(10) a.   With respect to the direct perception:
            - there is direct perception
            - there is no direct perception
      b.   With respect to the nature of the inference:
            - doxastic-information based, like (epistemic) modals
            - efficacy-based
            - (possibly something else: no inference at all?)

We further propose that the semantics of *-te-* is (11). According to (11), *-te-* introduces two types of non-at-issue meaning. On the one hand, the event directly perceived as evidence by the speaker and the event denoted by the prejacent should be efficaciously linked. On the other hand, LT, or the time when the evidence is acquired, should precede UT. Furthermore, we simply assume that the at-issue meaning introduced by *-te-* is the prejacent itself.

(11) a.   The non-at-issue meaning introduced by *-te-*:
            i. The evidence acquired by the evidence holder via her direct perception should be *efficaciously linked* to the event denoted by the prejacent.
            ii. LT should precede UT.
      b.   The at-issue meaning introduced by *-te-* is the prejacent itself.

Now we need to further define what it means for two events to be efficaciously linked. To answer this question, let us adopt Copley and Harley's (2015) efficacy condition:

(12) The efficacy condition (revised from Copley and Harley, 2015)
      For two events, e_1 and e_2, e_1 is efficacious with respect to e_2 iff e_2 will naturally follow from e_1 if e_1 holds and there is no intervening force which prevents e_1 from holding.

That is, for two events, e_1 and e_2, we say e_1 is efficaciously linked to e_2 when, if there is no stronger force to prevent e_1 from holding, e_1 has an inertia to continue to e_2.

Let us explain our proposal in more detail. According to our proposal, when using *-te-*, the evidence source is direct perception, but the evidence type is inference (or, with *-te-*, the speaker should make an inference based on her direct perceptive evidence). In terms of our previous typology, we can say that, with respect to direct perception, *-te-* requires direct perception, and with respect to the type of inference, *-te-* introduces an inference based on the efficacy condition (Copley and Harley, 2015). Furthermore, as previous studies, we lexically specify that to use *-te-*, LT should precede UT. Crucially, no relative tense is assumed: the tense under *-te-* is evaluated not against LT but against UT. This means that the prejacent of *-te-* should include tense. For example, the prejacent of (1a) and (1b) should be (13a) and (13b), respectively, and the tense of *-te-*'s prejacent should be interpreted with respect to UT.

(13) a. The prejacent of (1a): it rains / it is raining.
     b. The prejacent of (1b): it rained.

3.2. Why a new typology, and why efficacy?

At this point one might wonder why we need to revise previous typologies of evidentials, and why we need to assume efficacy as a kind of characteristic that an inference can be based on, which is different from the inference triggered by epistemic modals. To justify our proposal, let us first begin with the typology. The revised typology we proposed in (10) is inspired by Krawczyk (2012). According to her, a proper theory of evidentials needs to distinguish between the evidence type and the type of source of information. The reason why we need this distinction is that the evidence acquired by a speaker should be used to efficiently present the prejacent in the discourse. In other words, by using an evidential, a speaker indicates the nature of the evidence that an assertion is based on, and while doing so, the speaker believes that this information regarding her evidence can contribute to the resolution of the Question under Discussion (QuD: Roberts, 1996; see below for further discussion). Assuming this, Krawczyk (2012) further proposes that the dichotomy of the types of evidentials is not directly related with the type of source of information, but rather should be determined by what she calls the 'evidence type', which consists of the following two elements: the speaker's evidence itself and the inference from that evidence toward the resolution of QuD.

To see what this means more clearly, consider (1a) 'it is raining' (with *-te-*) and (1b) 'it rained' (with *-te-*) again. When uttering (1b), by employing *-te-*, the speaker indicates that she has direct perceptive evidence such as the wet ground. From this, the speaker infers the prejacent that it rained, and this prejacent will contribute to the resolution of QuD. That is, to utter the prejacent to resolve QuD, there should be some inference from the speaker's directly perceived evidence to the prejacent.[4] Due to (11ii), we can easily extend this idea to (1a), saying that, in (1a) there is some inference from the directly perceived evidence at LT to the event denoted by the prejacent at UT, which corroborates our conclusion in Section 2.

Our next task is to discuss what a proper account for this inference triggered by *-te-* can be. As shown in Section 2, this inference is different from that of epistemic modals or of the predictive future: when using *-te-*, the speaker infers from her perception of some evidence at LT (before

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[4] In this sense, the nature of the inference, which determines the evidence type, can also be understood as a kind of felicity condition on evidential markers (cf. Kalsang, Speas and de Villiers, 2013).

UT), and this inference makes her commit to the prejacent, unlike with epistemic modals or the predictive future. In addition, in Section 2.3, we showed that this inference does not allow a pragmatic perspective shift (hence no hearsay evidentiality with -*te*-). As far as we can see, one way to account for this lack of pragmatic perspective shift is to assume that there is no attitude holder for the inference (see Section 4 for further discussion), and that when using -*te*-, the speaker makes an inference which is based on causation in the external world, or on efficacy, and therefore is attitude-independent. In the next subsection we will further show that this same inference can explain both (1a) and (1b), which have been assumed in previous literature as showing variable evidentiality.

3.3. Analysis

Let us see how our proposal explains our main examples in (1). First consider (1a), repeated below as (14).

(14) *Pi-ka*   *o-Ø-te-la.*
      rain-NOM   come-(PRES)-*te*-DECL
      'It is raining.'
      (Implication: the speaker directly perceived the pouring rain)

Here we assume that when -*te*- is used without overt tense, there is covert anaphoric tense (Lim, 2014; cf. Ramchand, 2018). When there is no temporal adverbial, this anaphoric tense is assumed to be anchored to UT. Given this, the prejacent of (14), *it is raining*, can be interpreted as holding at UT. [5] Now, suppose e_1 is the raining event before UT, and e_2 is the raining event at UT. Under our analysis, the speaker should perceive e_1 before UT, because LT should precede UT. The speaker efficaciously infers that e_1 before UT should be naturally extended to the event denoted by the prejacent, that is e_2. Since there is no overt tense, the speaker commits that it is raining at UT. That is, ET overlaps with UT. Here we have a minimal inference from e_1 to e_2, based on the efficacy, which we think has been misread as direct evidentiality.

Next, consider (1b), repeated below as (15).

(15) *Pi-ka*   *o-ass-te-la.*
      rain-NOM   come-PST-*te*-DECL
      'It rained.'
      (Implication: from perceived evidence such as the wet ground, the speaker infers that it rained)

Here let us say that e_3 is the perceived event of the ground being wet, and e_4 is the raining event at ET, which precedes UT. e_3 entails that it is not raining anymore at LT, and due to the efficacy condition, we can expect that e_3 is extended up to UT, which is compatible with the prejacent with the past tense: before LT, it rained, and it is not raining anymore at UT. In (15), while

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[5] As far as we can see, previous studies mainly focus on cases where ET precedes UT and do not pay attention to cases where ET overlaps with UT. We think that examples where ET overlaps with UT can be used to reveal the inferential nature of -*te*-.

perceiving e_3, the speaker can expect that there was a stronger event which prevented e_4 from holding up to LT.

Now a question arises: why can (15) not be uttered when the speaker directly perceived that it was raining? Or, why can (15) not be uttered via a minimal inference, unlike (14)? We explain these observations in the following way. Since we do not assume the relative tense theory, when -*ess*- is used, it is assumed to be evaluated against UT. Furthermore, if -*ess*- is anchored to UT, the prejacent of (15) becomes *it rained*, and with -*ess*-, the prejacent of (15) implies that the rain must stop at some time point t_1 before UT. Given this, suppose that the speaker saw the pouring rain at LT ($<$UT), which we call e_5. Due to the efficacy condition, which says that an event should be extended if there is no stronger force preventing it from happening, e_5 is not guaranteed to stop at t_1, but should be extended after t_1: hence infelicity.

Let us further emphasize that neither epistemic modals nor predictive futures can explain these observations. For example, in (15), even though we saw that it rained before, without efficacy, we could easily infer that it stopped raining before UT. To account for why this, relatively easy, inference is blocked, we should assume efficacy, which is triggered independent of a specific situation or an attitude holder's knowledge or belief, unlike doxastic inference of (epistemic) modals. Similarly, in (14), for the past evidence at LT to guarantee that it is raining at UT, there should be inference based on efficacy: as we have discussed in relation to (9), if the speaker's doxastic knowledge is involved in the inference, there could be no reason why we assert that it is raining at UT.

In sum, by assuming that -*te*- requires directly perceived evidence and efficacy-based inference from that evidence, we can explain why -*te*- introduces direct evidentiality when there is no overt tense but introduces inferential evidentiality when there is the past tense -*ess*-. However, we have to point out that, even though our proposal apparently accounts for variable evidentiality, our analysis of -*te*- actually implies that there is no true variable evidentiality of -*te*-. In (14), the speaker infers the prejacent at UT from the perceived evidence at LT, which precedes UT, and in (15), the speaker infers the prejacent at ET, which precedes LT, from the perceived evidence at LT, which precedes UT. Anyway, in both cases, by using -*te*-, the speaker specifies that there is efficacy-based inference from direct evidence, and there is no true distinction between direct evidentiality and inferential evidentiality introduced by -*te*-.

4. Weak commitment

In Section 3.1, we proposed that, by employing -*te*-, the speaker makes an inference based on efficacy. One prediction of this analysis is that the speaker's commitment to the prejacent becomes weaker when using -*te*-: even though the speaker makes a commitment to the prejacent, -*te*- triggers the inference, and in this sense, an utterance with -*te*- should make the commitment weaker than it would be in plain declaratives, no matter how minimal the inference might be. Furthermore, since we argued that the inference triggered by -*te*- is different from that of epistemic modals, the weak commitment of -*te*- should be different from that of epistemic modals. This section aims to show that these predictions are actually borne out, especially with respect to the use of -*te*- in echo questions. Consider the following scenario.

(16)   After seeing that it is raining outside, Alice comes into the room, which does not have a window, and Bob asks Alice what's the weather like outside now. Alice answers…

In this situation, Alice can make a commitment to the proposition that it is raining outside, based on her direct evidence. Since Alice has direct perceptive evidence, the proposition *that it is raining outside* can be reported either with *-te-* or without *-te-*. After Alice's making an assertion with or without *-te-* about the event of raining at UT, Bob may ask a question by using *-tako*, which has been indicated in previous literature as a question ending for echo questions (Noh, 1998; Lee, 2010). Given this, interestingly, in the situation in (16), when Alice says that it is raining outside at UT without any evidential or modal, Bob can ask an echo question with a rising declarative, and Alice may answer this echo question by saying *ung* 'yes', but cannot answer it by saying *amato* 'probably.'

(17)   A: *Pakk-ey   pi-ka   o-Ø-a.*
          outside-LOC rain-NOM come-(PRES)-DECL
          'It is raining outside at UT.'
       B: *Pi-ka   o-n-tako?*
          rain-NOM come-PRES-Q
          'It is raining?'
       A: *Ung. / #Amato.*
           'Yes. / #Probably.'

When Alice makes an assertion with the evidential *-te-*, Bob can ask an echo question, but here, Alice may answer this echo question by saying *ung* or *amato*:

(18)   A: *Pakk-ey   pi-ka   o-Ø-te-la.*
          outside-LOC rain-NOM come-(PRES)-*te*-DECL
          'It is raining outside at UT.' (with direct evidentiality)
       B: *Pi-ka   o-n-tako?*
          rain-NOM come-PRES-Q
          'It is raining?'
       A: *Ung. / Amato.*
           'Yes. / Probably.'

Finally, when a modal, such as *thullimepsi* 'necessarily' is used, the echo question itself is not felicitous.

(19)   A: *Pakk-ey   pi-ka   thullimepsi o-Ø-a.*
          outside-LOC rain-NOM necessarily come-(PRES)-DECL
          'It must be raining outside at UT.'
       B: *#Pi-ka   o-n-tako?*
          rain-NOM come-PRES-Q
          'It is raining?'

Note that, as far as we can see, the same pattern is observed in English: an utterance with the modal *must* cannot be the target of an echo question.

(20)   A: It must be raining outside.
         B: #It is raining?

To account for this observation, let us adopt Gunlogson's (2008) distinction between independent and dependent commitments. In (21), upon seeing another person enter a windowless room, Robin may ask whether it is raining outside, but a rising declarative cannot be used in this case. In contrast, in (22), the other person carries some evidence that it is raining outside, and in this case, the speaker can use a rising declarative. Thus, Robin can ask a question with a rising declarative, given another person's evidence. That is, a rising declarative can be asked only when the questioner makes a dependent commitment (Gunlogson, 2008: 4).

(21)   *Scenario: Robin is sitting in a windowless computer room with no information about current weather conditions when another person enters from outdoors. Robin to the newcomer:*
         a.   Is it raining?
         b.   #It's raining?
         c.   #It's raining.

(22)   *Same scenario as before, but in this case the newcomer is wearing a wet raincoat and boots. Robin to the newcomer:*
         a.   Is it raining?
         b.   It's raining?
         c.   (I see that/So/Oh) It's raining.

Given this, let us assume that an echo question with *-tako* is a kind of inquisitive rising declarative (Jeong, 2018). Even though there is no consensus concerning the relation between echo questions and rising declaratives, we can think that, in the context of (16) above, Bob is willing to accept Alice's commitment, but there is still some uncertainty, and so he may ask an echo question to resolve this uncertainty. In any case, Bob's echo question should be based on Alice's commitment, and therefore let us assume that Bob's question with *-tako* is a kind of inquisitive rising declaratives (*á la* Jeong, 2018).

If an echo question is a kind of inquisitive rising declarative, we can further posit that it requires a dependent commitment (Gunlogson, 2003, 2008; Jeong, 2018; a.o.). In this sense, using an inquisitive rising declarative is different from the well-known assent/dissent test (Faller, 2002, 2006; a.o.):

(23)   A: *Pakk-ey   pi-ka   o-Ø-te-la.*
             outside-LOC rain-NOM come-(PRES)-*te*-DECL
             'It is raining outside at UT.' (with direct evidentiality)
         B: *Ung, kulay / Ani, kuken aniya.*
             'Yes, it is.' / 'No, it isn't.'

With respect to our echo question test, (18) is more similar to (17) than to (19). In (17) and (18), Bob's utterance requires a commitment dependent on Alice's commitment. The acceptability of an inquisitive rising declarative in (18) shows that A's commitment to the prejacent is equivalent to that of (17), considering the dependent commitment. In (19), however,

an inquisitive rising declarative is not allowed: the commitment of evidentials is different from the commitment of epistemic modals. Furthermore, although both (17) and (18) allow inquisitive rising declaratives, they are not completely identical with respect to commitment, as shown by the response 'probably'. That is, Alice's commitment to the proposition in (18) is somewhat *weak*.

To explain this observation, we adopt scoreboard semantics (Farkas and Bruce, 2010), specifically its revised version (Malamud and Stephenson, 2015). In scoreboard semantics, the discourse commitment (DC) is assumed to be a tuple of the individual commitment sets, and projected discourse commitment sets of conversational participants are assumed, which are marked with *. According to Malamud and Stephenson (2015), the projected discourse commitment, or DC*, proposes a tentative update concerning a metalinguistic issue, and the content of a DC* is updated to DC when a metalinguistic issue is settled during the conversation. In this model, weak commitment can be understood as updating a DC* rather than a DC itself.

In scoreboard semantics, the context update of Alice's uttering that it is raining outside at UT in (18) can be modelled as in Table 1.

Table 1: Scoreboard semantics for (18)

	Previous	(i) After A's assertion	(ii) Judgment step: efficacy	(iii) After B accepts (i)
DC_A	{}	{}	{p}	{}
DC_A^*	{{}}	{{p}}	{{}}	{{}}
DC_B	{}	{}	{}	{}
DC_B^*	{{}}	{{}}	{{}}	{{}}
Table	< >	< >	<{p}>	< >
CG	{q}	{q}	{q}	{q,r,p}
CG^*	{{q}}	{{q,r}}	{{q,r,p}}	{{q,r,p}}

p: prejacent, *r*: perceived evidence, *q*: previously shared proposition in the common ground (CG)

When Alice asserts that it is raining outside with *-te-*, or the prejacent *p* with *-te-*, we assume that *p* is not directly added to A's DC, but to A's DC*, as in (i) in Table 1, which reflects Alice's weak commitment to the prejacent. Following Malamud and Stephenson, we assume that, for a proposition in the DC* to move to the DC, a certain *metalinguistic condition* should be satisfied. We propose that *-te-* introduces the efficacy-based inference as a metalinguistic condition which has to do with the causal relation between events or situations in the external world. That is, we distinguish between the efficacy-based inference, on the one hand, and the doxastic-based inference, on the other hand, and assume that the former is derived by the causal relation which every participant in the conversation accepts as just given in the context. In this sense, the efficacy-based inference is assumed to be autonomous, and therefore is independent of any doxastic holder. More specifically, the efficacy condition is applied to verify whether the inference from *r* to *p* is valid, which we call 'judgment step'. This differs from the doxastic-based inference, where a certain epistemic holder and her reasoning is assumed. If the inference from *r* to *p* turns out to be valid via the judgment step, *p* can be added both to the DC_A and the *Table*, as shown in (ii) in Table 1. *r*, being not-at-issue content, cannot be added to the DC and the Table, which represents at-issue content of the conversation: *r* is directly added to the

projected common ground, or CG*. After p is updated to the Table, p is also added to the CG*. Finally, after Bob accepts Alice's utterance, p is removed from the Table, and p and r are finally added to the CG, see (iii). Given all this, since DC$_A$ guarantees Alice's commitment to p via the judgement step, Bob's requirement of dependent commitment in (18) can be satisfied, and that is why Bob can use a rising declarative in (18).

When there is neither an evidential nor an epistemic modal, or when Alice simply asserts that it is raining outside at the utterance time, as in (17) above, the asserted proposition directly moves to Alice's DC, to the Table as well as to the CG*, and after B accepts this, p is moved to the CG. This is illustrated in Table 2.

<div align="center">Table 2: Scoreboard semantics for (17)</div>

	Previous	(i) After A's assertion	(ii) After B accepts (i)
DC$_A$	{}	{p}	{}
DC$_A$*	{{}}	{{}}	{{}}
DC$_B$	{}	{}	{}
DC$_B$*	{{}}	{{}}	{{}}
Table	< >	<{p}>	< >
CG	{q}	{q}	{q,p}
CG*	{{q}}	{{q,p}}	{{q,p}}

Let us next briefly discuss some implications of our analysis. Note that, usually, the adverb *amato* 'probably' cannot appear with the entire proposition with *–te-*.

(24) *?Amato pi-ka   o-Ø-te-la.*
      probably rain-NOM come-(PRES)-*te*-DECL
      'Probably it is raining.'

However, in (18), in Alice's answer to Bob's echo question, *amato* 'probably' or *ung* 'yes' can both be used. Then why is there the difference between (18) and (24)? Or, why does the speaker's certainty become weaker in answering Bob's echo question?

To address this issue, let us take a closer look at (18). In (18), when Alice first asserts that it is raining outside (= p), with *-te-*, Alice is sure that p will be updated from DC$_A$* to DC$_A$. Bob utters an echo question about p (as a kind of refutation regarding p). Alice may regard Bob's echo question either as a question/refutation regarding her inference based on efficacy, or Alice she may think that Bob is raising the possibility that $\neg p$. However, Alice still thinks that p is more likely than $\neg p$, since Bob's refutation is not about p itself but about the judgment step. For example, if we replace 'probably' with 'maybe', Alice's answer becomes infelicitous, as shown in (25).

(25) A: *Pakk-ey   pi-ka   o-Ø-te-la.*
         outside-LOC rain-NOM come-(PRES)-*te*-DECL
         'It is raining outside at UT.' (with direct evidentiality)

B: *Pi-ka o-n-tako?*
 rain-NOM come-PRES-Q
 'It is raining?'
A: *#Hoksina.*
 'Maybe.'

Given this, let us compare (17) (where there is neither a modal nor an evidential) and (18) (where the evidential *-te-* is used). In (17), Alice utters *p*, and Bob refutes *p*, and if Alice accepts this refutation she makes a commitment to ¬*p*. In contrast, in (18), Alice utters *p* with *-te-*. Here, let us suppose that Bob refutes *p*. In this case, even if Alice accepts this refutation, this does not necessarily mean that she commits to ¬*p*. If she just withdraws the inference, there is still a chance to make a commitment to either *p* or ¬*p*. Or, in both cases, Alice can reject Bob's refutation, by saying 'Yes.' In this sense, we attribute Alice's weakened reply to Bob's echo question to the metalinguistic condition introduced by *-te-* (that is, efficacy). It is unclear how modal-based analyses can account for these observations.

Now, let us further compare *-te-* with epistemic modals. Again, the inference triggered by *-te-* is different from that of epistemic modals. While the former is extra-linguistically given, the latter involves the speaker's reasoning based on his/her doxastic information. In using epistemic modals, moreover, the speaker should make a commitment to the modal and the prejacent, not just to the prejacent itself. Therefore, unlike in (17) and (18), Alice's utterance in (19) does not update *p* to DC$_A$. Given a proviso that a dependent commitment arises based on the DC of the conversational partner, we can explain why Bob's reply in (19) cannot satisfy the requirement of a dependent commitment to *p*; hence infelicity. The previous assent/dissent test cannot explain this observations. We believe, this can only be tested by the echo question in terms of an inquisitive rising declarative.

5. Concluding remarks

In this paper, we showed that *-te-* involves an inference from evidence which was directly perceived before UT. Unlike the inference of epistemic modals, which is based on the speaker's doxastic worlds, the inference of *-te-* is based on the efficacy condition. Due to the inference based on efficacy, *-te-* introduces a weaker commitment, and this weak commitment, which is different from that of epistemic modals, can be tested by using rising declarative questions.

Let us conclude this paper by pointing out two implications of our proposal. The first implication is about the difference between Korean *-te-* and Bulgarian *-l* (Izvorski, 1997; Smirnova, 2013; Koev, 2017; a.o.). Based on our newly proposed typology of evidentials, we argue that Bulgarian *-l* requires direct perception, and its inference is based on the possible worlds compatible with the evidence, like (epistemic) modals. As pointed out by Arregui, Rivero and Salanova, (2017), *-l* does not need to utilize relative tense. Furthermore, our analysis can explain why *-l* allows hearsay evidentiality. As a modal, *-l* introduces an independent attitude holder (i.e. principal), whose report of the prejacent the speaker perceives, and due to a sort of perspective shift from the speaker to this attitude holder (AnderBois, 2014; Pancheva and Rudin, 2019; Faller, 2019; a.o.), this attitude holder makes a commitment to the prejacent, which results in hearsay evidentiality.

Comparing with Bulgarian -*l*, first, Korean -*te*- introduces an efficacy-based inference, that is, an inference based on the inertia of events in the external world, and therefore, it does not need to introduce an independent attitude holder, unlike a doxastic-based inference. We further argue that here lies the difference between -*te*- and -*l*: there is no perspective shift with -*te*-, which explains why -*te*- excludes hearsay evidentiality, unlike -*l*.

The second implication is about the typology of evidentials. Previous typologies of evidentials are mainly concerned with the type of information sources, as for instance that of Willett (1988):

(26) Evidential classification: Willett (1988: 57)
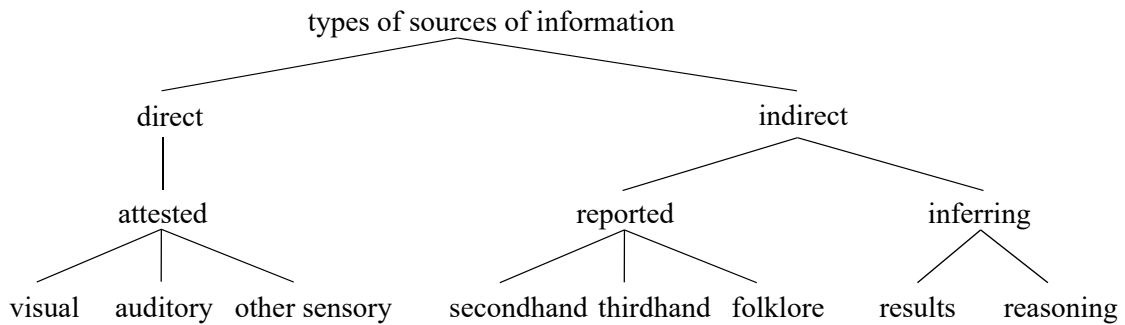
In contrast, we basically adopt Krawczyk's (2012) proposal, according to which evidentials should be classified with respect to the evidence type, an inference type which concerns the relation between the evidence and the QuD. Krawczyk (2012) analyzes various types of inference involved in using evidentials in terms of abduction. In this respect, our proposal is different from Krawczyk's: we are concerned the question when an evidential triggers an inference, whether this inference is doxastic-based, efficacy-based, or something else. In addition to this, we are also concerned with the issue of whether there is direct perception of evidence or not (see also Kalsang et al., 2013). We tentatively propose the following typology for evidentials:

(27) Evidential classification: our proposal
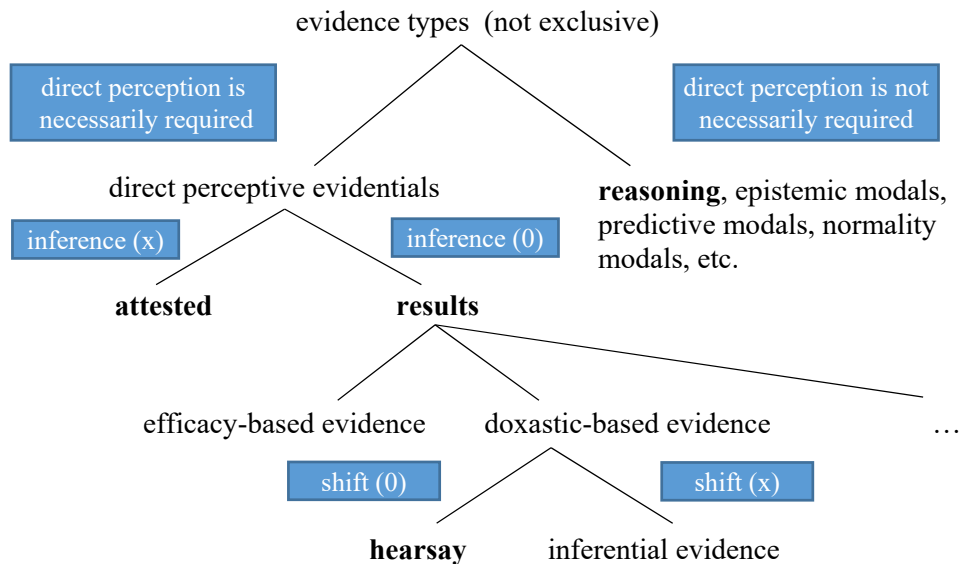
We further note that our analysis can be understood in parallel with vF&G's (2010) and Matthewson's (2015) classifications of evidentials. Both vF&G (2010) and Matthewson (2015) argue that epistemic modals are a subset of evidentials, and the indirectness plays a major role here. In this respect, what (27) reveals is that the (in)directness distinction lies in whether direct perception on evidence is necessarily required or not: epistemic modals, as a kind of unmarked morphemes to indicate the type of evidence, do not require any directly perceived evidence. This also makes us classify both reasoning evidentials and various kinds of modals under the same category; the only difference among them is the nature of inferences that are their basis. Accordingly, our proposal can explain the unique characteristics of -te- (inference based on direct perceptive evidence: see also Lim, 2014), without manipulating the sources of information (cf. Matthewson, 2020). It can also capture the similarity and the difference between result evidentials and hearsay evidentials: both require direct perception of some evidence, but the different kinds of inference are involved in that only the latter allows pragmatic perspective shift. Several problems remain unexplained, such as the difference between hearsay and other reportative evidentials, and explanations in more detail of the relation between different types of evidential markers. We leave these for topics for future research.

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