



Title	The Restriction on Epistemic Must
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Citation	Osaka Literary Review. 2020, 58, p. 21-37
Version Type	VoR
URL	https://doi.org/10.18910/76022
rights	
Note	

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The Restriction on Epistemic *Must**

MAKIHARA Naoki

1. Introduction

This paper deals with some restriction on the epistemic use of *must*. Modality is centrally concerned with a speaker's attitude towards a proposition. In English, modality may be expressed by modal auxiliary verbs, lexical verbs such as *insist* and *permit*, adjectives such as *possible* and *necessary*, adverbs such as *perhaps* and *surely*, and nouns such as *possibility* and *permission*. In addition, it is generally said that the past tense, verb inflections, clause type, subordination, and parentheticals can also express modality (see Huddleston and Pullum (2002: 173-175)). In this paper, I focus on modal auxiliary verbs, especially *must*.

Modality is divided into two types, epistemic and root.¹ Epistemic modality expresses the necessity or possibility of the truth of the proposition, whereas root modality expresses a duty, obligation, or permission imposed on someone or something, or an ability or willingness of someone or something. These meanings may be expressed by the same modal auxiliaries, so English modal auxiliaries have ambiguities in their meanings. Let us consider (1), (2) and (3).

- (1) Amber should be home by now. (Murphy and Koskela (2010: 106))
a. It is probable that Amber is home by now. [epistemic]
b. Amber has an obligation to be home. [root]
- (2) He may sleep downstairs. (Huddleston and Pullum (2002: 178))
a. Perhaps he sleeps downstairs. [epistemic]
b. He is allowed to sleep downstairs. [root]
- (3) You must be very tactful. (Huddleston and Pullum (2002: 178))
a. I am forced to conclude that you are very tactful. [epistemic]

- b. Be very tactful. [root]

As shown in (1)–(3), ambiguities may be clarified by the use of other modal expressions. When modal auxiliaries appear out of the blue, they seem ambiguous.

According to English grammar as instructed in Japanese schools, *must* has epistemic meanings when prejacent are headed by stative verbs and only root meanings when the prejacent are headed by eventive verbs (Kodera (2016: 118), Nakamura et al. (2017: 126)).² See (4).

- (4) a. The Tigers must win tomorrow's game. [only root]
 (Nakamura et al. (2017: 126))
 b. It's five o'clock. John must come home soon. [only root]
 (Kodera (2016: 118))

Nakamura et al. (2017) and Kodera (2016) say that *must* in (4) expresses only root meanings. When we want to express epistemic meanings, we should say *the Tigers are sure/bound to win tomorrow's game* and *I'm sure (that) John will come home soon*. It should be added that this tendency disappears when other modal auxiliaries are used.

Some studies have treated the aspectual or temporal relationship between modal meanings and the modal prejacent (Lakoff (1972), Palmer (2001), and Ramchand (2016) etc.). The aim of this paper is to examine the restrictions on *must* in epistemic uses proposed in earlier studies so as to demonstrate that one proposal is superior to the other.

This paper is organized as follows: Section 2 reviews some of the previous studies that investigate this restriction on epistemic meanings. In Section 3, I point out some problems of previous analyses, and then in Section 4 I resolve these problems with the proposal made in this paper. Section 5 concludes this paper.

2. Previous Studies

This section reviews previous studies dealing with the relationship between modal meanings (epistemic or root) and the modal prejacent. The restrictions on epistemic *must* proposed in previous studies can be divided into two types: Aspectual restrictions and temporal restrictions. First, I present the data that I concern in this paper (2.1). Then, I examine an aspectual restriction (2.2) and a temporal one (2.3).

2.1. Some Observations

Before observing some data, I explain an aspectual classification of verbs and predicates: stative and eventive (non-stative). Stative verbs and predicates, such as *know*, *believe*, *be sad* and *live in Japan*, denote some states or some conditions and do not contain movements or natural finishing points, while eventive verbs and predicates, such as *walk*, *build a house* and *reach the summit*, denote some events and sometimes have natural finishing points (see Kearns (2011: Ch.8)). There are some tests to distinguish them. For example, stative verbs cannot take the progressive form while eventive verbs can as in (5).³

- | | |
|------------------------------------|------------|
| (5) a. *I am having two daughters. | [stative] |
| b. John is singing a song. | [eventive] |

Another example of these tests involves a “move” in narrative time (Partee (1984), Katz (2003)). In a story, stative predicates are fixed to the current reference times while eventive predicates bring about some movements of reference times, as illustrated below.

- | | |
|---|--------------------|
| (6) a. John woke up. The sky was clear and the washing was on the line. | |
| b. John woke up. The sky was cleared and he put the wash out to dry. | (Katz (2003: 211)) |

In (6), *was clear* and *was on the line* are stative predicates, whereas *woke up*, *was cleared* and *put the wash out to dry* are eventive predicates. (6a) describes the moment of John's awakening; while the sky was clear and the washing was on the line, John woke up. On the other hand, (6b) does not describe a single moment, that of John's awakening, but rather a process in time; John woke up, then the sky was cleared, and finally he put the wash out to dry. I will utilize this test in Section 3.

Now, I look on some data. Asakawa and Kamata (1986) state that when the modal preajcent is headed by stative verbs, progressive forms, or perfect forms, *must* is allowed to have an epistemic meaning, as shown in (7a–d), while when the preajcent is headed by non-stative verbs, *must* only has a root meaning as in (8a–c).

(7) OK Epistemic

- a. Mary must have some problem: she keeps crying. [stative verb]
- b. Surely there must be some reasons. [stative verb]
- c. He must be travelling now. [progressive]
- d. You must have left your handbag in the train. [perfect]

(Asakawa and Kamata (1986: 173, 182, 183))

(8) *Epistemic, OK Root

- a. You really must come and see us soon. [non-stative verb]
- b. British industry must improve its productivity. [non-stative verb]
- c. You must pull your socks up. [non-stative verb]

(Huddleston and Pullum (2002: 178))

Asakawa and Kamata (1986) only describe these phenomena. The reason that *must* expresses an epistemic meaning in these cases is not stated.

2.2. ESS Modals

Ramchand (2014) tries to answer why *must* expresses an epistemic meaning when the prejacent is in a certain aspectual class, as we have observed in (7). She divides modal verbs into two groups that she calls Epistemic Stative-Sensitive Modals (ESS Modals, for short) and non-ESS Modals, defined as follows:

(9) Epistemic Stative-Sensitive (ESS) Modals:

ESS Modals are those that are technically ambiguous between an epistemic and circumstantial interpretation, but can only get that epistemic interpretation when combined with a stative prejacent.

(Ramchand (2014: 103))

She says *must*, *can't*, and *will* are ESS Modals, while *should*, *could*, and *might* are non-ESS Modals. Consider the examples in (10) and (11).

(10) ESS Modals: *must*, *can't*, *will*

a. Eeyore must / can't / will be sad. [epistemic or root, stative]

b. Eeyore must / can't / will go to Christopher Robin's party.

[only root, eventive]

(11) non-ESS Modals: *should*, *could*, *might*

a. Eeyore might be sad / in the field. [epistemic]

b. Eeyore might go to Christopher Robin's party. [epistemic]

(adapted from Ramchand (2014: 103))

As do Asakawa and Kamata (1986), Ramchand (2014) includes perfects and progressives as well as lexical stative verbs in (10a) and (11a) above. In addition, she includes habitual interpretations of eventive predicates, as in (12).

(12) OK Epistemic, OK Root

a. John must be running the marathon (right now). [progressive]

- b. John must have seen that movie already. [perfect]
 c. John must work hard for a living. [habitual]
 (Ramchand (2014: 104))

She claims that these predicates are stative prejacent. She tries to resolve the modal's ambiguity with syntax-semantics interface. She proposes that the evaluation time of *must* needs stative prejacent as well as the English present tense does. The syntactic ordering presented by her is Epistemic>Tense>Root. The difference between ESS and non-ESS Modals is the way their time variables are determined, which are derived from their lexical meaning. The variables of ESS Modals are determined indexically, which means ESS Modals anchors their variables to the utterance situation. On the other hand, the variables of non-ESS Modals are resolved anaphorically, that is, they are set in by context or discourse. Finally, she points out the English present tense requires stative predicates because it must be related to the utterance time, which is a moment (see Taylor (1977) and Bennett and Partee (1978) for detailed discussion). In the characteristic of being related to the utterance time, *must* resembles the English present tense closely, so *must* also requires stative prejacent. However, I think her assumption is incorrect and her generalization insufficient, as I shall argue in the next section.

2.3. Non-Future Condition

Lakoff (1972) and Sawada (1990, 2006) propose the following restriction on epistemic *must* from a temporal point of view.

(13) Non-Future Condition:

The propositional content of epistemic *must* cannot be a future event expressed by *will*.

(adapted from Sawada (1990: 211-212, 2006: 12))

- Ramchand focuses on the aspectual class of prejacents: stative and eventive, while as for the non-future condition it is the time of prejacents that determines whether *must* can obtain the epistemic meaning. I accept the non-future condition and reject Ramchand's generalization because of two reasons. One of them is the existence of an apparent counterexample, which has already shown in (14). The prejacents, *have been in his office* and *be in his office*, are stative, so epistemic meanings would arise in (14) if Ramchand's generalization were correct, but there is no epistemic reading in (14c). I shall argue the other reason in the next section.

3. Against Ramchand's Generalization

In this section, I deny Ramchand's assumption by arguing that perfect infinitives can be eventive, and further argue that her generalization is thus insufficient.

According to her analysis, the infinitival perfect in the preajacent of an ESS Modal has to be stative. For this, she relies on the claim that English perfect predicates are stative (Katz (2003)).

To the contrary, I claim that infinitival perfects acting as the preajacents of modals are different from perfect predicates. The first data come from co-occurrence relations with time adverbs designating a past time, such as *yesterday*, *last night*, and *a long time ago*. Let us consider the following examples:

- (16) a. Alice finished her dissertation yesterday.
- b. Alice must have finished her dissertation yesterday.
- c. *Alice has finished her dissertation yesterday. (Baker (1996: 561))
- (17) a. One of the cats' fleas must have bitten me last night. (BNC-web)
- b. He must have started writing his book a long time ago.
- (BNC-web)

In English, it is not surprising that the past tense can co-occur with past time adverbs, as in (16a), while the perfect cannot, as in (16c). However, perfect infinitives as modal preajacents can co-occur with these adverbs, as shown in (16b). This fact applies to other past time adverbs, as in (17). This shows that perfect infinitives do not always express a (semantically) perfect meaning and instead indicate past tense forms in modal contexts (Hofmann (1966)). Therefore, they can sometimes be stative, and sometimes eventive.

In order to distinguish stative and eventive, I utilize the "move" in narrative time test, as I stated in Section 2. Now consider the following examples:

- (18) Context: In a detective story, a murder happened. Mary was killed in a house. The dining room had only one door. A detective assumed that John was the murderer.
- a. John must have come into the dining room and shot Mary.
 - b. John must have shot Mary and come into the dining room.

If perfect infinitives are always stative, coming event and shooting event is interpreted as one moment event, that is, John shot Mary in the dining room, which means the situations described in (18a) and (18b) are the same. On the other hand, if they can be eventive, their interpretations depend on the order; in the case of (18a), John shot Mary in the dining room, while in (18b) John did so out of the room because eventive predicates create some movements of reference times.

My informants infer from (18a) that both Mary and John were in the dining room (at the time of the murder). From (18b), they infer that neither Mary nor John was in the dining room (at the time of the murder). Thus, the latter involves a process in time: In (18a), the event of “John’s coming into the dining room” occurs before the event of “John’s shooting Mary”, while in (18b), “John’s shooting Mary” occurs before “John’s coming into the dining room”. Therefore, we may conclude that perfect infinitives as modal prejacentes can be used as eventive predicates.

Some might argue that perfect infinitives represent the resultative perfect reading (Huddleston and Pullum (2002: 145)), so they are always stative. However, this argument is rejected by the behavior of *still* in these environments. As in (19), *still* cannot be used with present perfects.

- (19) *He has still read the report. (Huddleston and Pullum (2002: 712))

English present perfects imply that the state represented by their predicates continues indefinitely from some point in the past through the present into the future. For example, *John has been there* implies

the contrast between imperfective and perfective, is the key to classify the modal prejacent. Imperfective and perfective aspects are defined as (22) and (23), respectively:

(22) With the imperfective, the situation is viewed from within, with a focus on some feature of the internal structure.

(23) With the perfective, the situation is treated as a whole without reference to any internal structure.

(adapted from Huddleston and Pullum (2002: 124)
and Murphy and Koskela (2010: 84, 119))

In short, with imperfective aspect, we see a part of the situation from the inside, while with perfective aspect we see the whole situation from the outside. Let us consider some examples:

- (24) a. John is / was building a house. [present / past progressive]
 b. John built a house. [simple past]

A building event needs some time interval from its starting point to its ending point. When we say (24a), the utterance time is in the middle of the interval, that is, the viewpoint is inside the interval, which is imperfective aspect. On the other hand, in (24b), we perceive the building event as a whole from outside the interval, which is perfective aspect.

In English, it is generally said that stative verbs in simple present tense have imperfective aspect, as in (25).

- (25) John lives in Japan.

When we use an eventive verb in simple present tense, the sentence has a habitual reading. Bennett and Partee (1978) state that an eventive verb as a habitual is a disguised present progressive in a nonreportive sense, as in (26).

(26) a. John dates Mary.

b. John is frequently dating Mary. (Bennett and Partee (1978: 90))

As stated above, the progressive has imperfective aspect, so an eventive verb as a habitual also has imperfective aspect.

Next, I use viewpoint aspect to organize the modal prejacent. When the prejacent is headed by a verb with imperfective aspect, the epistemic meaning of *must* can arise, as in (27).

(27) *must* + imperfective → epistemic / root OK

a. John must like Brussel sprouts very much! [stative]

b. John must be running the marathon. [progressive]

c. John must work hard for a living. [habitual]

(Ramchand (2014: 103,104))

When the prejacent is perfective aspect, the epistemic *must* cannot be licensed, as in (28).

(28) *must* + perfective → only root OK

a. John must run to the store. [eventive (activity)]

b. John must build a very big house. [eventive (accomplishment)]

c. John must win the race. [eventive (achievement)]

(Ramchand (2014: 104))

When the prejacent is a perfect infinitive, there are two ways of viewing it. Consider (29).

(29) *must* + perfect infinitive → epistemic OK

a. Amina must have left by now.

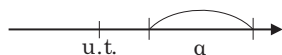
b. Amina must have left yesterday.

(Demirdache and Uribe-Etxebarria (2008: 1802))

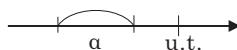
In (29a), the perfect infinitive behaves like a perfect. English present perfects need some time interval from the starting point to the utterance time, meaning that the situations described by them include the utterance time. Hence, we cannot view the whole situation from the outside. In other words, they have imperfective aspect. On the other hand, in (29b), the perfect infinitive behaves like a past tense. Therefore, it has perfective aspect.⁶

I assume that eventive verbs and perfect infinitives indicate past tense both have perfective aspect. However, there is a crucial difference in terms of temporal relation. With perfective aspect, we have to perceive the situation as a whole from the outside. Thus, the situation has to be before or after the utterance time. See (30).

(30) a. eventive



b. perfect infinitive as past



u.t.: the utterance time α : the situation described by the prejacent

When the prejacent is eventive, the situation occurs after the utterance time in (30a). On the other hand, when the prejacent is perfect infinitive used as past, the situation occurs before the utterance time in (30b).

Now, I return to the aim of this paper, determining why epistemic *must* is restricted. What is important is the viewpoint aspectual distinction, not the stative / eventive one. When we use *must* in its epistemic use, we can infer only situations set over or before the utterance time. As shown in (27) and (29), the imperfective and the perfective set in the past (see (30b)) license the epistemic reading of *must* because imperfective prejacent includes their utterance time or because perfective prejacent set in the past precede their utterance time. On the other hand, the epistemic reading cannot arise when the prejacent is a perfective set after the utterance time (see (30a)), as in (28).

thing to do with this phenomenon (cf. Kratzer (1981)), this issue remains for further discussion.

Notes

- * This paper is based on my bachelor thesis for Osaka University, 2019. I am grateful to Eri Tanaka, Sadayuki Okada, Masaharu Kato, and Takao Kamiyama for helpful discussions and comments. All errors are of course mine.
- ¹ In this paper, I use “root” to mean non-epistemic. Several studies have been made on the classification of modality. As far as the purpose of this thesis is concerned, it is not necessary to discuss this matter in detail, for which I refer the interested reader to Palmer (2001).
- ² A prejacent is defined as the proposition taken by the modals. There may be a question as to whether the prejacent is a proposition, but following von Stechow and Heim (2011: 30 n.1), I assume that the semantic type of a prejacent is a truth-value.
- ³ In fact, some stative verbs can take the progressive, but these progressives carry implications that the states mentioned by given sentences are temporal. Let us compare (i) with (ii).
 - (i) We live in London.
 - (ii) We are living in London. (Kearns (2011: 182))
 (i) has no implication. By contrast, (ii) implies that we are not in London in the near future. This difference and how to deal with it is beyond the scope of this paper.
- ⁴ Huddleston and Pullum (2002) and Sawada (2006) point out that *must* can express epistemicity for the future only when it is combined with *surely*, as in (i).
 - (i) It must surely rain soon. (Huddleston and Pullum (2002: 182))
- ⁵ Again, as non-future condition applies only to epistemic *must*, the instances of *must* in (15) are grammatical when they represent root meanings.
- ⁶ I specify the behavior of the perfect infinitives with references to their co-occurrence with time adverbials. Present perfect can co-occur with *by now* and cannot co-occur with *yesterday*, contrary to past tense. See (ii) and (iii).
 - (ii) Amina has left by now / *yesterday.
 - (iii) Amina left *by now / yesterday.
 (Demirdache and Uribe-Etxebarria (2008: 1802))

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