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Leszek Szymański

University of Zielona Góra, Poland, L.Szymanski@in.uz.zgora.pl

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ORIGINAL STUDY

An Empirical Investigation into the Semantics of the Polish Modal *musieć* [must] with Aspect and Negation

Leszek Szymański 

University of Zielona Góra, Poland

ABSTRACT

The present paper makes an attempt to employ concepts developed in philosophy and logic in order to explain natural language phenomena. The study centers on the meanings of the Polish modal verb *musieć* in relation to aspect and negation. It uses authentic language samples excerpted from *Narodowy Korpus Języka Polskiego* [The National Corpus of Polish]. It adapts the model of *the semantic field of modal expressions* (Kratzer, 1991) to disambiguate the modal, focusing on the characteristics of the conversational backgrounds that the speaker evaluates in expressing their modal evaluation of an event. The study proposes that the lack of modality-aspect and modality-negation interaction may be explained with the characteristics of the conversational backgrounds.

Keywords: Aspect, Conversational background, Epistemic modality, Negation, Root modality, Semantic field of modal expressions

Introduction

Researchers perceive *modality* as a broad concept which has become of scholarly interest among philosophers, logicians and linguists (e.g. Abraham & Leiss (eds.), 2008; Bybee et al., 1994; Chrzanowska, 1989; Hacquard, 2011; Kaufmann et al., 2006; Kotin, 2012; Kratzer, 2012; Lyons, 1977; Nuyts, 2006; Palmer, 1986/2001; Portner, 2009; Szymański, 2019; Van der Auwera & Plungian, 1998; Von Wright, 1951). Philosophers' interest in modality appeared already in ancient Greece (Chrzanowska, 1989). Aristotle discusses types of what is possible and what is necessary in his philosophical treatise *Metaphysics* (Malink, 2024), which corresponds to the perception of modality by contemporary logicians and some linguists (e.g. Kratzer, 1991, 2012; Szymański, 2019). The cited Greek philosopher viewed modality as “a relationship between the proposition p and the real

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E-mail address: L.Szymanski@in.uz.zgora.pl (L. Szymański).

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state of affairs in terms of truth, possibility, necessity, or certainty” (after Chrzanowska, 1989, p. 5).

Since language is used to express various modal attitudes, we can speak of *linguistic modality*, i.e. linguistic devices used to express modal meanings. One of the first language-related definitions of modality is attributed to Bally (1942) (after Boniecka, 1976), for whom modality meant various attitudes a speaker has towards their utterance (Boniecka, 1976, p. 103).

In the present paper, we will make attempts to show how concepts deriving from philosophy and logic can be employed to solve certain puzzles concerning modal expressions. Thus, the study discussed below ascribes to the concept of *open linguistics* put forth by Furdal (1977) (see also Szymański, 2022).

Speaking of modals, one of their characteristics frequently referred to the literature is their ambiguity. It can, however, be solved with contextual cues (Hacquard, 2006, 2010, 2011; Kratzer, 1991, 2012). This is so because in natural contexts words are not uttered in contextless isolation (Hacquard, 2011, p. 1490).

In the study that follows, we will adapt the model of *the semantic field of modal expressions* (Kratzer, 1991) in an attempt to show how context can be used to disambiguate the Polish modal verb *musieć* [must]. In addition, we will employ this model to demonstrate the interaction of modality with aspect and negation, which aims at investigating how aspect and negation interact with *musieć* influencing its meanings. The analysis uses language material retrieved from *Narodowy Korpus Języka Polskiego* [The National Corpus of Polish] (Przepiórkowski et al., 2012). Hence, the study discussed below constitutes a development of the corpus-based study presented in Szymański (2025).

The paper consists of five sections. This Introduction is followed by section 2, which establishes the theoretical framework for the study. Next, section 3 briefly discusses the semantics of the Polish modal *musieć*. Then, section 4 deals with the analysis. It starts with a description of the material, and presents an analysis of modality’s interfaces with negation and aspect exemplified with Polish *musieć*. The text finishes with Conclusions.

Theoretical background

Modality

Four distinct phases can be distinguished in the study of linguistic modality (Łapa, 2021, pp. 22–23). The first phase focuses on logical and formal grammars, involving modality in sentences without context. The second phase addresses the interpretation of modality within context, which constitutes a development influenced by pragmalinguistic theories. The third phase expands the scope beyond individual sentences to include the level of the text (cf. *discourse modality* in Portner, 2009). The fourth phase builds on previous research, applying established frameworks to the study of modality in legal texts (e.g. Kotin & Montusiewicz, 2022; Koźbiał, 2020).

Aside from the above, a substantial body of contemporary research on modality involves the concept of *evidentiality* (Aikhenvald, 2004), which encodes the source of information that a speaker uses in making a modal judgment. However, scholars disagree on how to view evidentiality. Hengeveld (2004) and Palmer (1986/2001) consider it a subtype of epistemic modality, while Aikhenvald (2004) and De Haan (1999) see it as a separate category. Kotin (2024), on the other hand, in his diachronic study, defines evidentiality as a function that ensures a strong confirmation of the truth of reported events.

This study is a linguistic investigation of modality, which we understand as a semantic concept that deals with possibility and necessity (Kratzer, 1991, 2012; Portner, 2009). This perception of modality refers to the Aristotelian concept, and is also the way in which

modality is perceived by logicians. We need to make a remark here that classical logic does not concern modal expressions in natural languages. Nevertheless, ideas developed within this field of knowledge can be adjusted to suit natural language analysis (Portner, 2009, pp. 29–45; Szymański, 2022). We will try to demonstrate it below.

Our study will deal with contextual disambiguation of the Polish modal verb *musieć*. We will do this by classifying the modal meanings it expresses into categories. The classic typology of modality was introduced by Von Wright (1951) in his work titled “An Essay in Modal Logic”. He put forth four types of modality. *Alethic modality* is truth-oriented and refers to the speaker’s judgment on the possibility or necessity of the content of the message. *Epistemic modality* relates to the speaker’s knowledge or opinion on the validity of a proposition. *Deontic modality* pertains to the speaker’s vision of what the world should be like. *Existential modality* addresses the existence of an entity in the world under some or any circumstances.

The logic-embedded classification by Von Wright (1951) was the starting point for further developed typologies of modal meanings in natural languages. Alethic and existential modalities are primarily of interest to philosophers and logicians, whereas epistemic and deontic modalities have been used in taxonomies advanced by linguists.

Research on different languages, together with diverse theoretical approaches, has resulted in a certain number of taxonomies of modality in natural languages (see e.g. Bybee et al., 1994; Hengeveld, 2004; Nauze, 2008; Palmer, 1986/2001; Portner, 2009; Szymański, 2015; Van der Auwera & Plungian, 1998 or Von Stechow, 2006). Polish linguists tend to apply a dichotomous classification of modality into: *deontic* and *epistemic* (e.g. Grzegorzczak, 2010).

The theoretical model adapted in this study also involves a binary approach to classifying modality. It allows for the classification of modal meanings into *root* or *epistemic*, with *root* being an inclusive term for all non-epistemic meanings, which come from the evaluation of the event circumstances (see e.g. Hegarty, 2016).

This study employs the model of *the semantic field of modal expressions* (Kratzer, 1991) as its theoretical framework. This approach is grounded in modal logic, which considers modal operators as quantifiers over *possible worlds* (Hacquard, 2011; Portner, 2009). A possible world is a possible state of affairs, which is different from the current one (see e.g. Carnap, 1956; Hintikka, 1962; Kripke, 1963; Lewis, 1973 or Pruss, 2001).

As said before, we interpret a modal in its context of use. This context forms a *conversational background* in a particular situation (Kratzer, 1981, 1991, 2012). It regulates the set of possible worlds that the speaker evaluates. The concept of conversational background underpins the framework of *the semantic field of modal expressions* (Kratzer, 1991), which is composed of three domains: the *modal force*, the *modal base* and the *ordering source*. Taken together, these three domains produce a modal meaning (cf. Kratzer, 2012, p. 68), so we will perceive them as basic components of a modal meaning.

The *modal force* relates to how strong the relationship between the uttered proposition and a set of other propositions is. There are two types of the modal force: *possibility* (*it is possible that*) and *necessity* (*it is necessary that*), which can be subject to gradation, for example: “necessity, weak necessity, good possibility, possibility, slight possibility, at least as good a possibility, better possibility, maybe others” (Kratzer, 1991, p. 649). Let us exemplify the types of the modal force with the following sentences:

(1) You **must** know the answer.

(2) You **may** know the answer.

The modal force comes out of the speaker’s evaluation of the *modal base*, which is a conversational background that determines all the information available in the context of

the uttered proposition. In other words, it is a set of propositions that the speaker evaluates when forming a modal judgment.

The basis of evaluation may come either from the spatio-temporal characteristics of the proposition that the speaker refers to, or from the speaker's knowledge, opinion or belief. The former entails a *circumstantial modal base*, while the latter makes an *epistemic modal base*. This binary approach to the modal bases regulates the dichotomous taxonomy of modals into: *root modals*, which take circumstantial modal bases ("in view of the relevant facts"), and *epistemic modals*, which take epistemic modal bases ("in view of what is known") (Kratzer, 1991, p. 650).

There is one more conversational background which is called the *ordering source*. It regulates the sequencing of available worlds in the modal evaluation. The ordering source is strictly related to the type of the modal base, and hence circumstantial ordering sources involve, for example, "laws, aims, plans, wishes" (Kratzer, 1991, p. 649), while epistemic ordering sources involve the speaker's thoughts, opinions and beliefs.

Let us illustrate the above with the following sentence:

(3) You **must** be able to read.

Must in (3) can express either an *obligation* or *speaker's certainty*. The former comes out when the speaker expresses an imposition on the event participant that they must be able to read. This modal evaluation comes from the circumstances in which the ability to read may be required for a number of reasons, such as: to understand a text, to get a job, to get a promotion, to be admitted to school, to learn something, or for any other reason that may occur in a given situation. Thus, each of these situations constitutes an ordering source, and the modal base is circumstantial. On the contrary, the speaker can express their conviction that the event participant is able to read, which they draw from what they have observed, what they have heard or their opinion about the event participant. This entails an epistemic modal base.

The model described above accounts for contextual disambiguation of modals, which is why it was adapted for this study. Kratzer (1991, p. 650) states that "[r]oot modality comprises all occurrences of modals with a circumstantial modal base. Epistemic modality comprises all occurrences of modals with an epistemic modal base". Thus, it can be used to make this disambiguation binary, which helps to maintain the clarity of reasoning. As Leiss (2008, p. 18) observes, "[a]ny serious classification has to be binary. Non-binary terminology regularly ends up as lists of different readings of modals, without exhibiting any explanatory force". The dichotomous classification of modality into root and epistemic is an "important traditional way of classifying varieties of modality" (Portner, 2009, p. 2), which is why we will use these labels in the study below.

Modality in interaction

Existing research has reported on the interaction of modality with other grammatical categories. It has been found that there is a correlation between the expressed modal flavor (root or epistemic) and the way the event is presented in the proposition, hence an interplay between modality and aspect (e.g. Abraham, 1999, 2008, 2020; Abraham & Leiss (eds.), 2008; Hacquard, 2006, 2010, 2011, 2016; Leiss, 2008; Kotin & Montusiewicz, 2022; Szymański, 2016, 2017, 2018, 2019, 2021, 2022). It has been established that root modality correlates with the perfective, whereas epistemic modality co-exists with the imperfective (see Abraham, 2008, 2020). Let us consider the following example sentences (taken from Abraham, 1999, p. 66):

(4) a. He **must die**.

b. He **must be dying**.

The event in (4a) is terminative and telic; plus, it is expressed with a nonprogressive verb form, thus it is *perfective*. On the other hand, the event in (4b) is progressive, which entails its atelicity, and thus it is *imperfective* (cf. [Szymański, 2019](#)). Each of these events entails a different type of modality: in (4a) *must* expresses a root (deontic) meaning (of obligation), while in (4b) *must* expresses an epistemic meaning (of speaker's conviction). Thus, this type of interaction can be observed at the level of the modal base. It can be explained in the following way (see [Hacquard, 2006, 2016](#)). Root modality triggers the actualization of the event, or a potential for the event to take place (cf. *actuality entailment* in [Bhatt, 1999](#)). This, together with a short time restriction, results in a perfective reading of the event. On the other hand, epistemic modals do not entail the necessity for the event to be actualized. This is claimed for languages with an overt morphological distinction between the perfective and the imperfective ([Hacquard, 2016: 47](#)), such as Polish.

In addition, modality has been found to interact with negation (e.g. [De Haan, 1997](#); [Iatridou & Zeijlstra, 2013](#); [Morante & Sporleder, 2012](#); [Radden, 2007](#); [Szymański, 2016, 2017, 2021](#); [Wiemer et al., 2023](#)). Research has reported that negation may exert its influence on the expressed modality or on the event in the proposition. Let us consider the examples below:

(5) Mike **can't find** his glasses.

(6) Mike **shouldn't look** for his glasses in the car.

The above sentences can be interpreted as follows: (5) it is *not possible* for Mike to find his glasses, and (6) it is necessary that Mike *does not look* for his glasses in the car. Consequently, (5) exemplifies *negated modality*, and (6) typifies a *negated event*. Following this, a negated event cannot be actualized, which is excluded by negation, thus it is imperfective.

Moreover, under the influence of negation, some modals, for example: *can* or *must* in English, produce new meanings, which can be observed in the examples below:

(7) I've just seen her driving away, so she **can't be** at home.

(8) You **mustn't smoke** in my office.

In (7), the speaker expresses their certainty that she is not at home, which they base on the fact that they have seen her driving away. In (8), the speaker expresses the forbiddance of smoking in their office. Thus, in (7), *can*, which typically expresses root meanings, receives an epistemic interpretation, which is due to the impact of negation (see [Szymański, 2021](#)). Moreover, the interaction of *can* and negation is also revealed at the level of the modal force, because the prototypical *possibility* changes into *necessity* (see [Szymański, 2021](#)). On the contrary, the interpretation of *must* in (8) does not change from root to epistemic under the influence of negation, nor does the modal force of necessity change. However, the meaning of negated *must* is not the opposite of deontic *must*, but the logical necessity of a negated event. This is due to different ordering source(s) that speakers evaluate for negated and non-negated *must* (see [Szymański, 2016](#)).

Furthermore, a corpus study on Polish ([Wiemer et al., 2023](#)) offers a development of modality-negation as well as modality-aspect convergence in a different direction. Based on a clear distinction among: aspect, (a)telicity and actionality, the study proposes that the basic dichotomy is not root vs. epistemic interpretations, but between deontic and circumstantial (dynamic) interpretations.

Musieć and its meanings in Polish

Musieć is the infinitive form of a Polish modal verb that translates into English as *must* (either root or epistemic) or sometimes *have to*. It is thus used to express two prototypical meaning categories (Ligara, 1997). The first one includes an *obligation*, thus a *deontic* reading, or a *necessity*, thus an *alethic* reading. Let us exemplify an *obligation* with (9) and a *necessity* with (10):

(9) **Musisz** zjeść zupę.

‘You must eat the soup up.’

(10) Żeby prowadzić samochód, **musisz** zdać egzamin.

‘In order to drive a car, you must pass an exam.’

In the present study, we will label this meaning category *root* (modality).

The other meaning category comprises the epistemic reading of *musieć*, which is *speaker’s certainty* or their *strong conviction* about the existence of a situation. It can be exemplified as follows:

(11) Ona **musiała** widzieć ten wypadek.

‘She must have seen the accident.’

Before proceeding to the analysis, a remark needs to be made. Polish verbs are inflected for: person, number, tense, aspect, mood, voice, and gender (Bał, 1984). In the present study, we will investigate the semantics of *musieć* irrespective of its inflections.

A recent corpus-based study (Szymański, 2025) also employs the said Kratzerian model to disambiguate Polish *musieć*, focusing on the conversational backgrounds that underlie its meanings. It determines the semantic field of the modal verb using corpus data. Szymański’s (2025) study shows that *musieć* expresses the modal force of necessity. The modal evaluation can result from: empty (circumstances-based), obligative, teleological or volitive ordering sources, which entail a circumstantial modal base. However, when its interpretation involves: deductive, empty (knowledge-based) or stereotypical ordering sources, then *musieć* takes an epistemic modal base. The cited study additionally observes that the interpretation of the modal typically involves evaluation of more than one ordering source, and that these sources can operate independently, co-occur or intertwine (see also Szymański, 2024). The study discussed in this paper attempts at an empirical development of the one described in Szymański (2025) by tracing the role of the conversational backgrounds when aspect and negation exert their influence on *musieć*.

Analysis

Material

The language samples for this analysis were excerpted from *Narodowy Korpus Języka Polskiego* (The National Corpus of Polish; henceforth: NKJP) (Przepiórkowski et al., 2012). The corpus can be accessed online at www.nkjp.pl. The whole collection has 1.8 billion running words, and the subcorpus that includes balanced samples includes 300 million running words.

The texts in NKJP are classified with reference to communication *channels* they were collected from. A channel is a technical way of transmitting a message (Górski & Łaziński,

2012, p. 16). Six main channels are used in NKJP to categorize texts: *the press, books, the internet, spoken, leaflet and handwriting*. The present study focuses on samples retrieved from the *spoken channel*, and it does not take into account any other text typology that the corpus compilers used.

The *spoken* subcorpus of NKJP is a collection of transcribed texts produced by native speakers of Polish which include: radio and television broadcasts, casual conversations, and texts named “Inne” [Other], which include speeches in the parliament. In total, this collection has 30 million running words, which is 10% of the balanced subcorpus of NKJP (Peżik et al., 2012a, pp. 38–39).

We narrowed down the choice of the material for this analysis to the *conversational* subcorpus of NKJP, which includes 240,192,461 running words. This collection has the total of 4,524 occurrences of *musieć* and its inflected forms, out of which we excerpted 500 tokens (ca. 11.05%). We used the PELCRA corpus search engine (see Peżik et al., 2012b) accessible online at <http://www.nkjp.uni.lodz.pl/>. We used the query string: *musieć***, in which the asterisks stand for all the possible inflectional forms of the verb. This limitation did not affect the analysis of the semantics of *musieć*.

In the sections that follow, we will attempt to show how the conversational backgrounds of the Polish modal *musieć* may be used to investigate the influence of aspect and negation on its meaning.

“Musieć” and aspect

First, we will verify whether there is any relationship between the modality type expressed with *musieć* and aspect in its perfective/imperfective dichotomy¹. With regard to the root flavor, *musieć* has been reported with both the perfective and imperfective. Let us consider the examples below:

(12) bo ona **musi** tą pracę **zawieźć** do Sylwii wieczorem żeby Sylwia to wszystko zgrała.. [tea chats]

‘because she must deliver the work to Sylwia in the evening so that Sylwia can save it all..’

(13) coś niesamowitego. aż się **muszę dowiedzieć**.. [friendly chats]

‘that’s amazing. I must find (it) out..’

Delivering a piece of work to someone in (12) is a telic event that terminates at its endpoint, which, in this example, is when the work is brought to Sylwia. Likewise, finding something out in (13) is telic and momentary. Thus, (12) and (13) exemplify root *musieć* with the perfective.

Now, let us look at the following examples:

(14) ale oczywiście że tak przecież nie ma takiego przymusu że każdy **musi mieć** wiesz rodzinę dzieci i tak dalej [women’s talks on women’s topics]

‘yes, of course, there’s no such an obligation that everyone must have, you know, a family, children and so on’

(15) ale dlaczego tak głośno **musisz gadać** ? przecież my wszyscy mamy dobry słuch [family talks and watching family photos]

¹ For a comprehensive account of aspect in Polish, the reader is advised to consult e.g. Łaziński (2020).

‘but why must you be talking so loudly? We all have good hearing.’

Having a family, in (14), is a state, which, by definition, is static and durative. In (15), the speaker refers to talking that is durative or repetitive. Thus, both (14) and (15) exemplify root *musieć* with the imperfective.

Regarding the epistemic flavor of *musieć*, let us consider the following examples:

(16) i nagle ona w ciąży i złapała go. na bank go **musiała złapać**. [women’s talks on women’s topics]

‘and all of a sudden she’s pregnant, and she’s caught him. Surely, she must have caught him.’

(17) ale to z kaszą **musiało przyjąć** bo w w kaszy generalnie było.. [cooking talks]

‘but it must have arrived with groats because it was generally in in the groats..’

In (16), the speaker expresses their certainty that she did “catch him”, which denotes a situation in which a woman got pregnant in order to maintain a relationship with a man and get married to him. Thus, such “catching a man” with pregnancy is a momentary, telic event. Similarly, a momentary event is when something comes, or is delivered, to one’s house, like in (17). Thus, both (16) and (17) exemplify epistemic *musieć* with the perfective.

On the contrary, let us look at the following utterances:

(18) chłopaki **się** strasznie chyba z niego **musieli śmiać**. [talks about power and other issues]

‘(I think) the guys must have been laughing at him terribly.’

(19) była generalnie hermetycznie zapakowana jeszcze więc **musiało być** w środku.. [cooking talks]

‘it was generally hermetically packed yet, so it must have been inside ..’

Laughing at someone, in (18), is an in-progress activity, without any goal of termination. Then, being inside a container, in (19), is a state. Thus, both (18) and (19) showcase instances of epistemic *musieć* with the imperfective.

Turning now to the quantitative data, let us examine the frequencies of the two aspects and the modal flavors. They are juxtaposed in [Table 1](#).

Table 1. The modal flavors of *musieć* with the viewpoint aspect.

	root	epistemic
perfective	288 (60.63%)	9 (36%)
imperfective	182 (38.32%)	16 (64%)
unidentified ²	5 (0.11%)	0
TOTAL	475	25

As the frequencies in [Table 1](#) show, root *musieć* tends to co-occur more often with the perfective (60.63 %) and epistemic *musieć* favors the imperfective (64%). These findings seem to confirm [Abraham’s \(2008\)](#) patterns of modality-aspect interfaces, according to which root modality converges strongly with the perfective, while epistemic modality converges strongly with the imperfective, only to a certain degree.

² The contexts provided by the online NKJP software did not allow us to establish the events.

Nevertheless, there are still 38.32% occurrences of root *musieć* and 36% occurrences of epistemic *musieć* which do not follow these patterns. Thus, there must be a factor behind the modal, whose influence on the expressed modal flavor is stronger than that of aspect.

Let us propose possible explanations for the fact that it is not always so that the perfective triggers the root meanings of *musieć* and that the imperfective yields its epistemic meanings. We will refer to the notion of the conversational backgrounds described above (cf. [Szymański, 2019](#)).

Regarding the points in time, in each of the examples with root *musieć*, (12)–(15), the speech time is the present. There are differences, however, regarding the reference and event times (see Abraham, 2022). In (12) and (13), the events are located in the future and the reference time is posterior to the speech time. Assuming the short time restriction for the realization of these events, we can observe root modality with the perfective. Contrary to this, in (14) and (15) the event time is the present: in (14), it is the generally perceived present, and in (15), it is parallel to the utterance time (at the moment of speaking). So, as the reference time is the present, there is no posteriority that would trigger the perfective.

As for the points in time in the examples with epistemic *musieć*, (16)–(19), in all of them the speech time is the present. The event time is the past, and the reference time is anteriority. Even though the events in (16) and (17) are perfective, there is no possibility for them to be actualized; nor do we know whether they have been actualized. Thus, the lack of the actuality entailment ([Bhatt, 1999](#)) yields epistemic readings.

With reference to the actuality entailment, let us also investigate the role of the event participant. By the *event participant*, we mean a thematic participant that performs the semantic role of: an *agent*, an *experiencer* or a *cause*.

A circumstantial modal base requires the event participant to be present or have the activity actually available to them at the event time, so that the event can be actualized. Thus, with root *musieć* in (12)–(15), the event expressed in the proposition, or at least one of its conversational backgrounds (or possible worlds), is available to the participant. In (12), she is the deliverer herself, so delivering the work to Sylwia is available to her; plus, she is present in the place at the delivery time. Then, in (13), if the speaker desires to find it out, then they must be present in the place where the finding out takes place. Similarly, in (14), the event participants are present in the circumstances in which having a family, children and so on is available to them. Finally, in (15), the activity of talking is performed by the agent, thus the circumstances are physically available to them.

In the epistemic modal base, the participant's presence and the world availability to them are inferred. In (16), before we analyze the possible worlds, we need to look at the phrase *złapać kogoś (na ciążę)* [catch someone with pregnancy]. This colloquial expression means that a woman becomes intentionally pregnant in order to maintain a relationship with the child's father. This intentionality of the woman's behavior is a key conversational background in this phrase, which can be explained as: "there is a world in which a woman wants to maintain a relationship with a man, and hence she gets pregnant with him". So, in (16), much as it is obvious that the pregnant woman was present in the circumstances in which she got pregnant, we do not know whether it was her intention to "catch" the man. This possible world and its availability to the woman is therefore assumed by the speaker. Next, in (17), the speaker deduces that the object they are talking about was delivered with groats. Thus, its presence in the package of groats is inferred, as the speaker did not see it there. A similar interpretation can be applied to (19). The speaker did not see whether the thing they are talking about was in the package or not. They only deduce its presence from the fact that the container was hermetically sealed. In (18), the speaker does not know whether it was so that the guys were laughing at him. The world in which they were is conjectured by the speaker.

Summing up the above, a factual possibility for the participant to actualize the event triggers root modality, thus when the event in the proposition is available to the event participant at the event time, then root modality is expressed. When the availability of the event to the event participant at the event time is inferred, then epistemic modality is expressed. This has also been shown for English, for example, by [Szymański \(2019\)](#).

“Musieć” and negation

The analyzed language material included samples of *musieć* in negative contexts, which we limited to the existence of the negator *nie* in the modal predicate. Thus, let us examine how root *musieć* reacts to negation. Examples of root *musieć* can be found in (20) and (21) below:

(20) **nie musisz** odpowiadać na to pytanie [an interview]

‘you don’t have to answer this question’

(21) i on powiedział że my **nie musimy** chodzić na zajęcia ale że musimy przygotować mu tę prezentację i oddać mu pracę, i wtedy **nie musimy** chodzić na zajęcia. [friends’ talks]

‘and he said that we don’t have to attend the classes but we have to prepare the presentation for him and hand in an assignment to him. And then we don’t have to attend the classes.’

In (20), the speaker states that there is no necessity or obligation for the event participant to answer the question they have just been asked by their interlocutor. The primary conversational background is the situation in which the speaker and the event participant are involved, thus the modal base is circumstantial (root modality). This circumstantial interpretation may come from the social rules of conversation, i.e. a possible world in which a person can choose whether they answer a question or not. Another rule governing this lack of obligation can be one imposed by the speaker, which may come from the speaker’s desire for their interlocutor to make the said choice. Also, a further ordering source underlying the modal interpretation that the speaker takes into account can be observed, i.e. the agent’s volition to answer the question. Example (21) includes two instances of negative *musieć*, each of which expresses the lack of obligation to attend the classes. Again, the speaker refers to the situation in which the event participants (here: students) are present, thus a circumstantial modal base (root modality). The speaker draws the lack of obligation from the rules imposed by the teacher or from what the teacher wants the students to do or not to do. Hence, the rules and the teacher’s volition constitute the ordering sources. A further ordering source that can be identified is the subject’s (agent’s) volition to attend the classes or not to do so, i.e. a world in which they have a choice. This possible world, however, is not the primary one that the speaker evaluates.

We have also reported on epistemic *musieć* with negation, for example:

(22) jak ja go dawno **musiałam nie widzieć** [on a burglary]

‘how long I must not have seen him? = I am sure I have not seen him for a long time.’

(23) ale to masz technologie to **musiałas nie mieć** tego no bo my mieliśmy na studiach [friends about apprenticeship]

‘but you have technology, you must not have had it, because we had it at college’

In (22), the speaker expresses their certainty that they have not seen him for a long time. They use their own knowledge of the time when they last saw him, so the modal base is epistemic. In (23), the speaker expresses their conviction that their interlocutor did not have a technology course. They make a deduction, which is an ordering source, on the basis of the fact that their interlocutor had the course at the time of the conversation – presumably, in that semester. In both (22) and (23), negation is placed before the main verb and it affects the event in the proposition.

Considering the above findings, one may draw a conclusion that whether *nie* negates the modality or the event depends on its position in the modal predicate. We have shown that when the negator comes before the modal, it negates the modality, and when it comes before the main verb, it negates the event. This can be patterned as follows:

NEG + *musieć* → NEG.root modality → NEG.OBLIGATION

musieć + NEG → NEG.epistemic modality → SPEAKER'S CERTAINTY NEG.event

However, the placement of the negator does not seem to influence the expressed modality type. Let us consider one more example:

(24) gość opowiadał jakimś typie który tak się słynał tego że **musiał nie pić** bo jak się jak pił to robił się po prostu nieobliczalny [In the darkness before a concert]

‘the guy was talking about some guy who was famous for this had to not drink, because when he drank, he became simply unpredictable’

In (24), the speaker evaluates the situation in which someone had to refrain from drinking, thus a circumstantial modal base (root modality). The negator *nie* affects the event, not the modality. Thus, the position of the negator in the modal predicate does not influence the modality type expressed with the modal verb.

The modality type is related to the modal base that the speaker evaluates. Circumstantial modal bases involve *actuality entailment* (Bhatt, 1999) or factual accessibility of the event to the event participant (see Szymański, 2019). In (20), answering the question is factually accessible because the participant is physically present in the circumstances. In (21), attending the classes is accessible to the event participants as they are this professor's students, and in (24), not drinking is accessible to the event participant, because the circumstances refer to his life. In contrast, seeing him in (22) was not factually available to the speaker, but they assumed it was. Likewise, the completion of the course in (23) was only supposedly available to the event participant. Thus, the availability of these events in (22) and (23) to their participants was inferred, which entails epistemic readings.

Conclusions

The study was set out as an advancement of Szymański (2025) and it aimed to empirically examine categorial interactions of modality expressed by the Polish modal *musieć* with aspect and with negation. In other words, it sought to identify the influence of aspect and negation on the meanings expressed by the said modal verb. The investigation looked into samples of authentic language retrieved from the *conversational* subcorpus of the *Narodowy Korpus Języka Polskiego* [The National Corpus of Polish].

The analysis adapted the *semantic field of modal expressions* (Kratzer, 1991) framework. Hence, the study demonstrated that concepts developed in philosophy and logic can be adjusted to an empirical linguistic analysis. This model was chosen because it helps to

disambiguate a modal with contextual cues, as well as because of the important role of the conversational backgrounds and their characteristics.

The study showed that *musieć* expresses the modal force of *necessity*. It can take either a *circumstantial* or *epistemic* modal base. This results in the expression of *obligation* or *necessity*, hence root modality, or *speaker's certainty*, hence epistemic modality. This is in line with Szymański's (2025) findings concerning the semantic field of *musieć*.

When it comes to modality-aspect interfaces, the study confirmed Abraham's (2008 p. 6) generalizations to a certain degree (approximately 60%). In the studied sample, the majority of root *musieć* converged with the perfective, and the majority of epistemic *musieć* converged with the imperfective. The non-compliance with these patterns can be explained with the characteristics of the conversational backgrounds, or possible worlds, which the speaker takes into account when making a modal judgment. The conversational backgrounds which feature factual availability of the event to its participant trigger root modality, while the conversational backgrounds with inferred availability of the event to its participant yield epistemic modality.

In addition, the study found that negation affects root *musieć*, which yields the meaning of the lack of obligation. This can be interpreted as: "there exists a world in which the agent is not obliged to do something" or "there exists a world in which it is not necessary for the agent to do something". Thus, this is a pattern of regular modality-negation interaction. A modality-negation interaction pattern like English root *mustn't*, which does not mean the opposite of root *must*, was not reported in this study (cf. Szymański, 2017).

The analysis also identified modality-negation convergence patterns: with root modality, negation affects the modality, and with epistemic modality, negation affects the event. This may result from the factual availability of the event to the event participant, which is evaluated by the speaker (cf. *actuality entailment* in Bhatt, 1999).

Although this study included *musieć* in negated contexts, modality-negation patterns were not studied extensively here, as we limited the form of negation to the negative particle *nie*. A natural progression of this analysis could be its extension to various types of negators and negative contexts (see e.g. Antas, 1991; Maciuszek, 2006). It may also be proposed that prospective future studies on *musieć* and negation take into consideration various genres and speech act types.

In spite of the limitations pointed out above, our study makes several contributions to the field of linguistics. For one thing, the study showed how aspect and negation contribute to modal meaning, and it determined patterns of their influences. It also verified the modality-aspect and modality-negation generalization put forth by Abraham (2008). Moreover, the analysis successfully demonstrated a possible adaptation of concepts developed in logic to explain situations in which these convergence patterns do not hold in a natural language, exemplified with Polish in this study. Finally, by employing tools developed in other fields, the study adds to the concept of *open linguistics* developed by Furdal (1977) (see also Szymański, 2022).

Conflict of interest

The author declares no conflict of interest.

Data availability

The study used language data excerpted from *Narodowy Korpus Języka Polskiego* (The National Corpus of Polish) available at www.nkjp.pl.

Author contribution

The author solely conceived the study, adapted an established methodological framework to the analysis of data obtained from a publicly available corpus, interpreted the findings, and wrote the manuscript.

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