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An empirical investigation into the semantic field of the Polish modal verb *musieć* ('must')

Badanie empiryczne pola semantycznego polskiego czasownika modalnego *musieć*

Abstract

The empirical study described in the article examines the semantics of the Polish modal verb *musieć* ('must'). The modal verb *musieć* can express both root (deontic) and epistemic meanings in Polish. The first category includes obligation or necessity for an event to occur. The second category comprises expressions of the speaker's convictions that a given event exists or has occurred. The author attempts to disambiguate the meanings of *musieć* contextually. The study employs concepts derived from philosophy and adapts them to investigate authentic language samples recorded in the spoken subcorpus of the National Corpus of Polish. The analysis establishes the conversational backgrounds whose evaluation results in an epistemic or root readings of *musieć* and leads to the modal force of necessity. The study shows that one modal meaning results from a number of possible worlds a speaker evaluates. Some of them are directly related to the event the speaker expresses in the proposition. Their evaluation results in a root (deontic) meaning. Others are related to what the speaker thinks or what their opinion is. As a result, an epistemic meaning emerges. However, we cannot exclude that the speaker's primary opinion is based on their evaluation of the event.

Keywords: conversational background, epistemic modality, modality, root modality, semantic field of modal expressions, contextual disambiguation

Abstrakt

Artykuł opisuje empiryczne studium semantyki polskiego czasownika modalnego *musieć*. Czasownik *musieć* może wyrażać w języku polskim znaczenia zarówno rdzenne (deontyczne), jak i epistemiczne. Do pierwszej kategorii zalicza się znaczenia obowiązku i konieczności wystąpienia jakiegoś zdarzenia. Do drugiej – wyrażenie przekonania nadawcy, że dane zdarzenie istnieje bądź zaistniało. Autor tekstu podejmuje próbę kontekstowej dezambiguacji znaczeń wyrażanych przez polski czasownik *musieć*. W badaniu wykorzystano koncepcje wywodzące się z filozofii, które zaadaptowano do analizy autentycznych próbek języka zarejestrowanych w podkorpusie mówionym

Narodowego Korpusu Języka Polskiego. W wyniku przeprowadzonej analizy ustalono tła konwersacyjne, na podstawie ewaluacji których nadawca wyraża modalność epistemiczną lub rdzenną, co w efekcie prowadzi do wyrażenia modalnej siły konieczności. Badanie pokazuje, że jedno znaczenie modalne wynika z uwzględnienia kilku światów możliwych, których ewaluacji dokonuje nadawca. Część z nich wynika z bezpośredniej sytuacji wyrażonej przez nadawcę w sądzie logicznym. W wyniku ich ewaluacji powstaje znaczenie rdzenne (deontyczne). Inne z kolei wynikają z tego, co nadawca myśli lub jaką ma opinię. W efekcie powstaje znaczenie epistemiczne. Nie da się jednak wykluczyć, że prymarna opinia nadawcy bywa oparta na ocenie sytuacji.

Słowa kluczowe: tło konwersacyjne, modalność epistemiczna, modalność, modalność rdzenna, pole semantyczne wyrażen modalnych, dezambiguacja kontekstowa

1. Introduction¹

One of the most striking characteristics of modals discussed in literature is their ambiguity, which can be decoded when we take into account contextual clues (Hacquard 2006, 2010, 2011; Kratzer 1991, 2012). Needless to say, words are not typically uttered without a context (Hacquard 2011: 1490); which, nonetheless, does not always allow one to disambiguate a modal in accordance with the speaker's intention.

The study described below aims at presenting a method of contextual disambiguation of the Polish modal verb *musieć* (must). It therefore adapts the model of *the semantic field of modal expressions* (Kratzer 1991), and attempts to establish the conversational backgrounds that make up the meanings expressed with *musieć*. The study described in this paper is the first attempt to apply this adaptation of the Kratzerian concepts to a Polish modal (cf. Jędrzejowski 2015).² The empirical research material comes from Narodowy Korpus Języka Polskiego [The National Corpus of Polish] (Przepiórkowski et al. (eds.) 2012).

The paper has been organized into five sections. After the current Introduction, section 2 addresses the issue of modality and presents the model of *the semantic field of modal expressions* (Kratzer 1991), establishing thus the research framework. Next, section 3 provides a brief overview of the semantics of the Polish modal *musieć*. Section 4 discusses the analysis. The text closes with a conclusion in section 5.

¹ I would like to thank the anonymous Reviewers for their careful consideration of the manuscript as well as insightful comments.

² A description of the model of *the semantic field of modal expressions* is available in Polish as Szymański (2021b).

2. Modality and the modal flavors

Modality is a broad concept that has originated in philosophy. It has also gained the interest of logicians. In this study, it will be given attention from a linguistic point of view, combining concepts that derive from philosophy and logic.

Out of the multitude of its existing definitions, this study perceives *modality* as a semantic concept dealing with possibility and necessity (Kratzer 1991, 2012). This understanding of modality comes from modal logic. Even though classical logic does not deal with the semantics of modal expressions in natural languages, concepts that come from it can be successfully adapted to natural language analysis (see Portner 2009: 29–45 or Szymański 2022).

A variety of theoretical approaches as well as numerous ways in which natural languages can express modality have brought about its various classifications (see e.g. Bybee et al. 1994; Hengeveld 2004; Łapa 2021; Nauze 2008; Palmer 1986/2001; Portner 2009; Szymański 2015; van der Auwera and Plungian 1998; von Stechow 2006 or von Wright 1951). Literature distinguishes four stages in the studies on linguistic modality (Łapa 2021: 22–23). The first one is based on logical and formal grammars, thus it centers on contextless sentential modality (see also Portner 2009). The second one involves a contextually embedded interpretation of modality expressed in a sentence, which results from the development of pragmalinguistic concepts. The third one shifts its focus above the level of a sentence to the text level (cf. *discourse modality* in Portner 2009). The fourth one continues previously-established research traditions and applies the already-acknowledged apparatus to descriptions of modality in legal texts and metatext.

As far as typological approaches to modality are concerned, Polish scholarly literature tends to draw a distinction between *deontic* and *epistemic* modality (e.g. Grzegorzczkova 2010). Polonists do not distinguish *dynamic* modality as a separate category (see e.g. Rozumko 2019: 52–53). Some scholars also refer to *alethic* modality (e.g. Rytel 1982), and some others add a fourth type – *imperceptive* modality, in which the speaker stresses that they did not witness the event expressed in the proposition themselves (e.g. Koseska-Toszeńska and Kotsyba 2008; cf. *evidentiality* in Aikhenvald 2004).

In the present study, we will classify the meanings expressed with *musieć* as *root* or *epistemic*, which is motivated by the fact that the theoretical model we apply in the analysis also uses this dichotomy. Moreover, we will address other theoretical proposals which use it as well.

In order to establish the above-said root / epistemic dichotomy, we will investigate the *conversational backgrounds*, which Kratzer introduces in her 1991 model of *the semantic field of modal expressions*, which is presented below. The theoretical foundations of this framework come from modal logic, which treats modal operators as quantifiers over *possible worlds* (Hacquard 2011; Portner 2009). *Universal quantifiers* correspond to the expression of *logical necessity* (“it is necessary that”). *Existential quantifiers* correspond to the expression of *logical possibility* (“it is possible that”). Each of them is assigned an *accessibility relation* which determines the availability of individual worlds in each particular situation.

A fundamental concept in the Kratzerian framework is a *possible world* (Hacquard 2011; Portner 2009). It denotes the possible state of affairs or what the world could have been like, which is different from the present one (see e.g. Carnap 1956; Hintikka 1962; Kripke 1963; Lewis 1973 or Pruss 2001).

As Hacquard (2011: 1489) observes, modal verbs in natural languages tend to be ambiguous. The Polish modal *musieć* (must) is an example of such a verb, since it can denote either root (deontic) or epistemic meanings (Jędrzejko 1987, 2001; Ligara 1997; Rytel 1982; Tabisz 2016). Consider the example below:

- (1) Tomek **musi** znać odpowiedź.
‘Tomek must know the answer.’

The modal *musi* [*must*.3.sing.present] in (1) can receive a root interpretation (of *obligation*) when Tomek’s knowledge of the answer results from an obligation which someone has imposed on him. However, the modal can receive an epistemic interpretation (of *speaker’s certainty* or *deduction*) when the speaker expresses they are convinced that Tomek knows the answer.

Modals have been observed to denote not only their basic meanings, but also further ones (Hacquard 2011: 1490). Kratzer (1977, 1981, 1991) identifies this as the occurrence of successive possible worlds available for a particular modal interpretation. Let us exemplify this with the following sentence:

- (2) Marek **musi** codziennie grać na trąbce.
‘Mark must play the trumpet every day.’

Taking its root interpretation, the modal *musieć* in (2) can express the meanings of *obligation* or *necessity* (Ligara 1997: 81). Thus, let us try to interpret some of the independent sources this modal flavor can come from. The obligation may have been imposed on Marek by his parents, his teacher, or the music school requirements. It may also be a necessity that comes from Marek’s intention to reach a certain mastery level in playing the trumpet, or his desire to do well in a music competition.

The above-listed secondary sources of obligation or necessity are heavily dependent on the context. Such individual modal readings can be interpreted with the use of the phrase “in view of” (Kratzer 1977: 340; Hacquard 2011: 1490). Hence, we can propose the following interpretations of (2):

In view of the obligation from his parents, Marek must play the trumpet every day.

In view of the obligation from his teacher, Marek must play the trumpet every day.

In view of his music school requirements, Marek must play the trumpet every day.

In view of his intention to reach a certain mastery level in playing the trumpet, Marek must play the trumpet every day.

In view of his desire to do well in a music competition, Marek must play the trumpet every day.

Even though authentic utterances hardly ever include a phrase like the *in view of* cited above, they are not devoid of the context in which they are pronounced (Kratzer 1977, 1981, 2012). Thus, every interpretation of a proposition hinges upon its context. The context constitutes a *conversational background* in a particular situation (Kratzer 1981, 1991, 2012). A conversational background determines the set of possible worlds that a speaker considers in a modal evaluation.

Conversational backgrounds underlie the model of *the semantic field of modal expressions* developed by Kratzer (1991). This framework consists of three domains: *the modal force*, *the modal base* and *the ordering source*. These three domains taken together bring about a modal meaning (cf. Kratzer 2012: 68), thus they can be treated as elementary components of any modal meaning.

The modal force is the strength of the relationship between the uttered proposition and a set of other propositions. Kratzer (1991) distinguishes between two types of the modal force: *possibility* and *necessity*, which clearly refers to the quantifiers over possible worlds in modal logic. Kratzer further suggests that diversified grades of the modal force can be distinguished, for example: “necessity, weak necessity, good possibility, possibility, slight possibility, at least as good a possibility, better possibility, maybe others” (1991: 649).

The modal base is a conversational background which determines all the information available in the context of the uttered proposition, that is, those in which the relevant propositions are true. This information forms the basis for the modal evaluation of the proposition in a given situation.

Kratzer distinguishes two types of the modal base. When the basis for the evaluation comes from the spatio-temporal characteristics that the speaker

refers to in the proposition, the modal base is termed *circumstantial*. When the basis for the evaluation comes from what the speaker knows, thinks or believes, then the modal base is called *epistemic*. This dichotomy of the modal bases regulates the dichotomous division of the modal flavors (Kratzer 1991: 650): *root modals* take circumstantial modal bases (“in view of the relevant facts”) and *epistemic modals* take epistemic modal bases (“in view of what is known”).

As already indicated above, a modal meaning may be influenced by a number of secondary sources. In the described model, Kratzer uses the term *the ordering source* to denote a conversational background that imposes the sequence of the available worlds in the particular modal evaluation. Circumstantial ordering sources involve, for example, “laws, aims, plans, wishes” (Kratzer 1991: 649), while epistemic ordering sources involve the speaker’s thoughts, opinions and beliefs.

In order to illustrate the concept of the ordering source, let us refer to examples (1) and (2) above. In (1), the circumstantial modal base may result from the fact that there is a world in which someone imposes an obligation on Tomek to know the answer. Thus, this obligation will be the circumstantial ordering source in this case. As regards the epistemic interpretation of (1), we can assume that there are worlds in which Tomek has read something or witnessed a situation, on which the speaker forms the modal evaluation of the expressed logical necessity. As regards example (2) above, the ordering sources are all the identified possible worlds, i.e.: an obligation imposed by the parents or teacher, the music school requirements, Marek’s intention to reach a certain mastery level in playing the trumpet or Marek’s desire to do well in a music competition. All these typify circumstantial ordering sources. It is also possible to propose an epistemic interpretation of *musieć* in (2), which is not discussed above, though. The meaning of speaker’s certainty in (2) may come from an evaluation of Marek’s skillful performance, which leads the speaker to deduce that he must practice every day.

The Kratzerian model of *the semantic field of modal expressions* has been chosen for two reasons: i) it determines contextual components of a modal meaning, and ii) it accounts for contextual disambiguation of modals. Thus, this model addresses the needs of a compositional analysis of modality viewed as a semantic notion, with its exponents both at the lexical and syntactic levels, which is realized as an individual’s linguistic activity set in a context (Boniecka 1999).

3. A note on the semantics of *musieć* in Polish

Musieć is the infinitive form of a modal verb classified among state verbs in Polish (Laskowski 1999: 157). Polish verbs are a heavily inflected class and verb conjugation is characterized by an abundance of forms (Bał 1984: 322). Polish verbs are inflected for: person, number, tense, mood, voice, and gender. Moreover, they are classified with regard to aspect as perfective or imperfective (see Łaziński 2020).

The verb *musieć* denotes two prototypical meaning categories (Ligara 1997). One of them is an *obligation*, thus a *deontic* reading, or a *necessity*, thus an *alethic* reading. It can be explicated as: “it is obligatory, necessary for the modalized subject (Y) to do, be in the state of P” (translated by the author from Ligara 1997: 80). Let us exemplify an *obligation* with (3) and *necessity* with (4):

- (3) **Musimy** jej pomóc.
‘We must help her.’
- (4) Żeby zdać egzamin, **musisz** zdobyć 75% punktów.
‘In order to pass the exam, you must score 75% points.’

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

The second meaning category of *musieć* is *speaker’s certainty* or their *strong conviction* about the existence of a situation. It can be explicated as: “it is certain, very probable for the sender (N) that P (= sentence S)” or “the sender (N) finds it certain, very probable that P (= sentence S)” (translated by the author from Ligara 1997: 81). It can be exemplified as follows:

- (5) Filip **musiał** o tym wiedzieć.
‘Filip must have known about it.’

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

4. The study

4.1. The material

The study used language samples excerpted from *Narodowy Korpus Języka Polskiego* (The National Corpus of Polish; henceforth: NKJP) (Przepiórkowski et al. (eds.) 2012). The full NKJP collection counts 1.8 billion words. The balanced subcorpus used in this study includes 300 million words. The corpus is available at www.nkjp.pl.

One of the ways of categorizing the collected texts in NKJP is a *channel*. It is understood as the technical way in which a message is transmitted (Górski and Łaziński 2012: 16). NKJP taxonomizes the texts into six main channels: *the press*, *books*, *the internet*, *spoken*, *leaflet* and *handwriting*. The material for the present study was narrowed to excerpts from the *spoken channel*. No other text typology used by the corpus compilers was used for material selection.

The *spoken* subcorpus of NKJP counts 30 million words, which equals 10% of the whole balanced subcorpus (Pęzik 2012a: 38–39). It includes three types of transcribed texts. Firstly, there are spoken data from the media. These include transcribed radio and television programs. Secondly, there are data from spoken conversations. These include transcribed conversations of native speakers of Polish. The subjects were of varied ages, and with various levels of education. They also came from various parts of Poland. Thirdly, there are texts labeled “Inne (Other)”. These include transcripts of parliamentary speeches and the Sejm committees of inquiry.

Out of the three above types, the study focused on the *conversational* type of spoken data transcribed and included in NKJP. This collection counts 1.9 million words (Pęzik 2012a: 39). For the purpose of the analysis, the material was limited to the conversational subcorpus, which includes 240,192,461 running words. The analysis focused on a sample of 500 tokens of *musieć*, in respective contexts, which were excerpted randomly by the online corpus software out of the total of 4,524 instances of *musieć* and its inflected forms stored in the subcorpus, which makes approximately 11.05%.

The language samples were excerpted with the corpus search engine called PELCRA (see Pęzik 2012b) available online at <http://www.nkjp.uni.lodz.pl/>. The following string of characters was keyed in: *musieć***, which is the infinitive form of the analyzed verb. The asterisks after the infinitive extend the query with all the possible inflectional forms of the verb. The excerpted forms of *musieć* were inflected for: tense, person, gender, number and mood. We did not make any aspectual distinctions, either. This, however, did not affect the analysis, whose intentional focus was qualitative. Nevertheless, the form of the query excluded possible elliptical constructions, such as *On musi do toalety* (He must [go/run] to the bathroom), which may be viewed by some as a limitation.

4.2. The analysis

To begin with, the study showed that *musieć* expresses the modal force of *necessity*. Consider the examples below:

- (6) pies **musi** mieć ogrodzenie [at a family meeting at grandparents']
'a dog must have an enclosure'
- (7) jak ty jesteś mała przy nim to on już **musi** być duży [at a family meeting at grandparents']
'if you are small compared to him, then he must be big'

In (6), the speaker recommends that a dog should have an enclosure (perhaps, to live within it). It can thus be paraphrased as "it is necessary for a dog to have an enclosure". In (7), the speaker expresses their strong conviction that he is big (or tall – more context is needed to disambiguate the adjective *duży*). This can be paraphrased as "it is logically necessary that he is big".

Examples (6) and (7) showcase the two modal flavors of *musieć*. In (6), the expressed necessity comes from what the speaker views necessary in the given circumstances, or what they insist takes place. A fenced area prevents a dog from running away. It also provides a dog with a feeling of its own place in which it finds an asylum after an intensive play or work. We can thus say that the necessity comes from the circumstances (or spatio-temporal characteristics) that the speaker refers to, and hence *musieć* in (6) takes a circumstantial modal base. This entails a root flavor of the modal. In (7), the speaker compares the size (or height) of the woman they are speaking with to the size (or height) of a man they are referring to. Thus, the modal judgment comes from what the speaker knows about the sizes (or heights) of the two people, and hence the modal takes an epistemic modal base. This entails an epistemic flavor of *musieć*.

With regard to the quantitative data pertaining to the modal flavors of *musieć* in the analyzed sample, the study attested 475 (95%) instances of its root flavor and 25 (5%) instances of its epistemic flavor. This was established through contextual disambiguation with the adapted Kratzerian framework. It may thus be concluded that *musieć* is primarily a root modal in spoken Polish.

This root orientation of the studied modal seems to be a language-specific trait. Polish does not offer much choice to replace root *musieć* with. There are phrases: *być zobowiązany* or *być zobligowany* (be obliged to) that denote an obligation. However, they express an obligation which is always imposed by an authoritative body before the speaking time, cannot be self-imposed (see below), and is rather formal. Thus, speakers of Polish seem not to have

other equivalents that could capture the meanings of root *musieć*. A reverse tendency has been observed in English, in which *have to* and *need to* have been reported to take over the role of root *must* (Johansson 2013). Moreover, the epistemic flavor of English *must* has been attested to outnumber its root flavor (Johansson 2013). As for epistemic *musieć*, speakers of Polish tend to express their certainty with other, non-verbal expressions, such as: *na pewno* or *z pewnością*. It may seem, therefore, justified to perceive the root orientation of *musieć* as a language-specific characteristic.

In what follows, we will investigate the circumstances under which it receives both root and epistemic readings by looking at the secondary conversational backgrounds, i.e. the ordering sources. The names for the ordering sources have been taken from Szymański (2019: 25–26).

Let us first focus on the ordering sources influencing the root flavor of *musieć*. To begin with, an event may be required by the situation the speaker refers to in the uttered proposition itself. This is an *empty* ordering source. In such circumstances, the necessity depends neither on the speaker nor on the agent, but on the speaker- and agent-external circumstances. Consider the example below:

- (8) ach my godzinę **musimy** jechać [family talks and watching family photos]
 ‘oh, we must travel for an hour’

In (8), the necessity for the agent to travel for an hour comes from the circumstances that the agent finds themselves in, and they do not have any direct influence on the course of the event. These circumstances in (8) include a typical traffic situation in the place that the speaker refers to.

In addition to the above, we can identify a *teleological* ordering source in (8). The agent must travel for an hour in order to reach a certain destination, which is the goal of the necessity. A teleological source can also be exemplified with the following utterance:

- (9) wpół do szóstej **muszę** wstać wyjść z psem. na szóstą do pracy.. [friends’ talks]
 ‘I must get up at half past five to walk the dog. I start work at six o’clock.’

In (9), the necessity results from two goals. One of them is the dog’s physiology that requires a walk in the morning. Thus, the goal is to take the dog for a walk so that the dog can perform its physiological activities. The other one concerns the time when the agent starts work. Thus, it is necessary that the walk occur at a time that will enable the agent to arrive at the workplace in time, which is the second goal.

Furthermore, obligations imposed by authoritative bodies have been reported as circumstantial ordering sources called *obligative*, for example:

- (10) ale jak pracujesz nawet na pół etatu to też pła **musi** płacić ZUS firma nie? [talks about power and other issues]
 ‘but when you work half-time, the company must pay your social insurance, right?’

The obligation in (10) is due to the Polish law. In this case, the ordering source is the legal regulation that makes an employer responsible for paying the employees’ insurance.

Also, instances of root *musieć* have been reported with the source of obligation being the speaker themselves, acting, in a way, as the authoritative body in the particular situation. Consider the example below:

- (11) to ja **muszę** sprawdzić es ka emkę wtedy jeszcze do Słupska [morning talk after a party]
 ‘so, I must check the fast urban train to Słupsk then’

In (11), the speaker imposes an obligation to check the train on herself. Thus, the *obligative* ordering source in this case is the speaker’s *self-imposition* of a task to do. It may also be so that the speaker imposes this on herself because she wants to check the train herself. Therefore, a further ordering source influencing the modal interpretation emerges here, which is the speaker’s volition, also known as a *boulomaic* ordering source.

Speaker’s volition has been reported as an ordering source in other examples, as well, for instance:

- (12) ja już w ogóle zaczęłam w internecie szukać tych jakichś kolorów ścian i ogólnie mam już zdjęcia **muszę** ci pokazać i **musisz** wiesz jako ekspert wyrazić swoją opinię [talk about renovation]
 ‘I’ve already started looking for some wall colors on the internet, and in general I have already had photos I must show to you, and, you know, you must express your opinion as an expert’

Example (12) includes two occurrences of *musieć*. In each of them the speaker expresses a necessity: (i) for herself to show the photos to her interlocutor, and (ii) for the interlocutor to express his opinion about the colors of the walls she has chosen. In both cases it is the speaker’s volition that underlies the modal readings. Hence, both could be paraphrased with the application of the modal verb *chcieć* [want] as: (i) “chcę ci pokazać zdjęcia (I want to show the photos to you)”, and (ii) “chcę, żebyś wyraził swoją opinię (I want you to express your opinion)”. Both *musieć* and *chcieć* express the modal force of necessity and they both take *boulomaic* ordering sources. However, the choice of *musieć* (must) over *chcieć* (want) may have been motivated by a higher level of the necessity, that is a stronger modal force, expressed by the former. In this way, the speaker was able to express their volition with more emphasis.

The study has also identified instances of *musieć* whose meanings could depend on more than one ordering source. Let us exemplify this with the following utterance:

- (13) nie wiem jakie ma plany. na pewno **musi** studia najpierw skończyć.. [talk about an apartment]
 ‘I don’t know what plans she has. Surely, she must first graduate from university.’

Musieć in (13) showcases a number of potential ordering sources. The graduation prior to another event can be required by some authoritative body. It can be, for example, the law that regulates some professions that require a university degree; it may be her parents that impose such an obligation on her before giving her some reward, or her employer before awarding her a promotion. It can also be a goal that she wants to achieve after the graduation. Here, again, it may be working in a profession that requires a university degree or a post-graduate program that she intends to apply for. Furthermore, the source of the necessity may also be someone’s desire that she first graduates. It may be her parents’ or even her own volition that influences the graduation necessity to be primary to other successes. Thus, *obligative* ordering sources tend to overlap with *teleological* and *boulomaic* ordering sources.

Another example with several ordering sources identified can be found in the following utterance:

- (14) i tam jeszcze ktoś coś otwiera jeszcze jakiś sklep inny w tym budynku no i ten koleś już **musi** podłączyć tą wodę [telephone talk]
 ‘and someone opens something there, some other shop in this building, and so the guy must connect the water (supply)’

One of the ordering sources in (14) can be the legal regulations according to which the owner of the building (here: “the guy”) is obliged to provide water supply to all the apartments, offices and shops located in the building. It may also be so that the speaker has such a verbal agreement with the building owner that the latter will provide water supply to the whole building after the final premises have been occupied. Further, another ordering source can be teleological because a shop needs water supply in order to function. In addition, a further ordering source may be the speaker’s desire that the water supply is finally installed by the building owner. Thus, the circumstantial modal base may stem from intertwining *obligative*, *teleological* and *boulomaic* ordering sources.

Considering the two examples above, we can conclude that it is possible that one modal meaning can emerge from more than one ordering source working simultaneously.

Let us now turn to the ordering sources structuring the epistemic modal meanings of *musieć*. The study found that speakers base their modal judgments on what they think, thus an *empty* ordering source. This can be exemplified with the following utterance:

- (15) A: no ja wiem z kropką ale nie ma nigdzie tu
 B: **musi** być
 C: a tam pod traktorem siedzą reszta pod traktorem wlaźła [family chats under a tree]
 'A: I do know, with a dot, but it's not here around.
 B: It must be [somewhere here around].
 C: And how about there? They're sitting under the tractor. The rest have gone under the tractor.'

In (15), three interlocutors are chatting about an animal with a dot. The available context does not inform us what animal it is. Speaker A tries to find the animal with a dot, but they cannot see it. Speaker B is convinced that the animal is somewhere around because they know that there is such an animal with a dot on the farm, and they use this knowledge to build the modal evaluation of the situation.

The study also found that epistemic modal evaluations can come from more than one ordering source at a time. Consider the example below:

- (16) A: był taki okres że przychodziła właśnie na wszystkich depresja zimowa czy coś związana właśnie z brakiem światła i z takimi lampkami chodzili wszyscy po ulicach..
 B: nie a coś w tym **musi** być [a chat about power and other issues]
 'A: There was such a period when everyone came down with a winter depression or something related to the lack of light, and everyone walked with such lamps in the streets.
 B: Right, there must be something about it.'

In (16), Speaker B expresses their conviction that there is a relation between the time described by Speaker A and people's behavior at that time. Thus, Speaker B uses their opinion to build the modal judgment. However, it is important to point out that this opinion is based on what the speaker deduces on the basis of the people's behavior, which, in this case, constitutes the evidence for the modal evaluation. Thus, the identified ordering sources can be labeled *empty* and *deductive*.

Furthermore, the study found that speakers' deductions can be made also on the basis of regular courses of events. Consider the following example:

- (17) A: zdejmij maseczkę po dwudziestu minutach. cebula piecze w otwarte ranki na skórze..
 B: ale to strasznie później człowiek **musi** walić po takiej cebuli.. [a chat about power and other issues]
 'A: remove the beauty mask after twenty minutes. You can feel the onion burning in the open little skin cracks.
 B: But you must stink awfully after such an onion (mask).'

Speaker B's deduction about one's smell comes from the smell of an onion – if an onion is applied on one's face, the smell of the onion will pass on the person, which will result in the person emitting the smell afterwards. Thus, the ordering sources are: *deductive* and *stereotypical*, which, in turn, makes the basis for the deduction.

Let us now juxtapose the above findings in a tabular form.

Table 1. The semantic field of *musieć*

	Modal force	Modal base	Ordering source
<i>musieć</i>	necessity	circumstantial	boulomaic
			empty
			obligative
			teleological
	epistemic		deductive
			empty
			stereotypical

The analysis has also reported on multiple ordering sources in examples of *musieć* in the conditional mood. Consider the sentences below:

- (18) i albo by się **musiał** odizolować od brata a od rodziny się przecież nie odizoluje.
 [women's talks on women's topics]
 'and either he would have to isolate [+perfective] himself from his brother, but one does not isolate themselves from their family.'
 (19) tylko **musiałbym** z domu wyjechać [family talks and watching family photos]
 'I just would have to leave home'

Expressing the conditional mood, both instances of *musieć* in (18) and (19) take primarily epistemic modal bases. The ordering source can be identified as *empty* in each case, as it is what the speakers think. It can also be so that the speakers express their convictions based on their deductions about what is necessary in each of the evaluated situations, thus a *deductive* ordering source.

In addition to the above, in both (18) and (19) further conversational backgrounds can be observed; however, these can be classified as circumstantial.

In (18), the further conversational backgrounds include: the speaker's (and maybe other people's) desire that the agent (here: he) separates himself from his brother, an obligation imposed on the agent, as well as the aim for this isolation, which may be losing contact with the brother and his influence on the agent. As for (19), we can identify the speaker's desire to leave home and the purpose of this action. Thus, boulomaic, deontic and teleological ordering sources underlie the speaker's deduction. It is important, however, to remark here that the circumstantial ordering sources do not constitute the direct basis for the modal evaluation. They comprise distant possible worlds taken by the speakers into account when forming the modal judgments (cf. Szymański's (2021a) observations for *can* in English, and Szymański (2024) for *must* in English).

5. Conclusion

The primary aim of the research described above was to empirically determine the semantic field of the Polish modal verb *musieć*. The study adapted the model of *the semantic field of modal expressions* proposed by Kratzer (1991), whose purpose is to help disambiguate modals. The analysis was carried out on samples of real-life language use excerpted from NKJP.

The study demonstrated that *musieć* expresses the modal force of *necessity*, and it can take either a *circumstantial* or *epistemic* modal base. The former results from *empty*, *obligative*, *teleological* or *volitive* ordering sources. The latter is structured by *deductive*, *empty* or *stereotypical* ordering sources.

In addition to the above, the results of this investigation show that it is possible that more than one ordering source operates to produce a modal meaning (see also Szymański 2024). They can also co-occur or intertwine with other ordering sources. Moreover, the study found that circumstantial possible worlds can underlie epistemic modal judgments. In such situations, the circumstantial possible worlds are not the primary conversational backgrounds that speakers use, but they constitute some distant possible worlds on which the expressed modal evaluation is based. Furthermore, the investigation proved that concepts developed in philosophy and logic can be successfully adapted to analyze modality expressed in a natural language, exemplified here with authentic language data from Polish. Thus, we crossed the boundaries that demarcate the academic field of linguistics, and showed it as an open field as advised by Furdal (1977; cf. Szymański 2022). Besides, our study stressed the importance of contextual disambig-

uation of modals, as well as demonstrated how certain contextual elements can be systematized and categorized.

A continuation of this study may be an attempt at determining how the semantic field of Polish *musieć* reflects modality's interaction with other grammatical categories, such as negation and aspect.

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