Investigating semantic and selectional properties of clause-embedding predicates in Polish

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written by

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Abstract

This thesis's main objects of study are natural language predicates that can embed clauses. These verbs or verb-like expressions usually represent some relation between the subject of a sentence and a proposition. Clause-embedding predicates differ in the types of clauses they can embed. The challenge for the compositional semantics of these predicates is to explain these differences in terms of their semantic properties by postulating general constraints. Since clause-embedding predicates occur in many languages, the postulated constraints should be verified against cross-linguistic data. In this project, I created a database of clause-embedding predicates from the Polish language using the methodology by Uegaki et al. (2022) and verified the constraints postulated in the literature against it. As a result of this procedure, I propose two new constraints, which refine the existing hypotheses that turned out to be false: 1. All non-veridical positive preferential predicates are anti-rogative. 2. Interrogative and declarative complements of all responsive predicates are always related by entailment. Moreover, I discuss several Polish predicates that are worth researching further. What is more, I performed an empirical study on the predicate "spodziewa si" (eng: "to expect"), which suggests that the predicates and their semantic properties may stand in relation different than simple binary satisfaction and that more empirical research should be performed to properly investigate this relation.

Contents

Chapter 1

Introduction

In our conversations, we frequently discuss our and other people's attitudes towards a propositions. We talk about what people know and believe, their wonders and doubts, their feelings, preferences and expectations. Moreover, we frequently report what they said, usually also describing how they said this thing; whether they announced it or whispered it to our ear; whether they made a firm claim or just assumed some proposition to be true. Expressing all these judgements frequently involves the use of clause-embedding predicates, i.e. verbs or verb-like expressions that usually represent some relation between a subject and a proposition.[1]

The compositional semantics of the clause-embedding predicates like "know", "wonder", or "believe" has been intensively discussed in the recent literature in linguistics and formal semantics (e.g. Spector and Egré, 2015; Theiler et al., 2018, 2019; Uegaki, 2019; Roelofsen and Uegaki, 2021). The main objective of studying these predicates is to find the constraints that describe their behaviour. Since clause-embedding predicates occur in many languages, the postulated constraints should be verified against cross-linguistic data. In this thesis, I made the following original contributions to achieving this goal:

1. I created a database of clause-embedding predicates in Polish containing almost 1500 data points concerning 49 predicates using the methodology by Uegaki

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[1]I write "usually", because of the predicates like *be true* or *be false*, which do not follow this pattern.

et al. (2022), and I verified the constraints postulated in the literature against it. I describe this database in Chapter 2 and the database itself constitutes Appendix A and Appendix B.

2. I refined the constraint postulated by Uegaki and Sudo (2019) to accommodate the issues I discovered while investigating negative preferential predicates. The new hypothesis I propose, states that all non-veridical *positive* preferential predicates are anti-rogative. It is discussed in Section 3.1.3.[2]

3. I proposed a new hypothesis - the entailment hypothesis - which states that for each predicate, its interrogative and declarative complements are always *related by entailment*. This hypothesis is confirmed by the database and previous theoretical investigations in the literature (Spector and Egré, 2015; Roelofsen and Uegaki, 2021). I discuss the entailment hypothesis in Section 3.1.5.

4. I performed a survey on the Polish predicate "spodziewa si" (eng: "to expect"), which sheds new light on the semantics of the clause-embedding predicates. The results of this experiment suggest that the predicates and their semantic properties may stand in relation different than simple binary satisfaction. I discuss the experiment in Chapter 4.

Moreover, in Section 1.2, I discuss the responsiveness puzzle presented in the paper by Uegaki (2019) and provide some arguments that the uniformity solution is preferable to the P-to-Q solution. In Section 1.3.1, I present a representational framework that allows to formally represent the semantic properties, which can be refined in future to a proper logical formalism. In Section 2.4, I addressed some methodological issues concerning the MECORE project by Uegaki et al. (2022). In Section 3.1, I discussed the most prominent constraints describing the behaviour of the clause-embedding predicates and verified them against my database. In Section 3.2, I discussed the most interesting predicates from the database, which should be investigated further.

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[2]This hypothesis was also independently suggested in the GLOW presentation by Özyıldız et al. (2022) as a potential solution to the issue with negative preferential predicates.

1.1 Variety of clause-embedding predicates

In this section, I will present different types of clause-embedding predicates and the puzzle of their selectional properties. Moreover, I will discuss the aim of the MECORE project and the role of cross-linguistic studies in its realisation.

As indicated in the title, this thesis's main objects of study are natural language predicates that can embed clauses. By predicates, I mean verbs or verb-like expressions that usually represent some relation between the subject of a sentence and the embedded clause. This relation can be an epistemic attitude, like in the case of verbs: *know*, *believe*, *think* or *wonder*. It can also express an action for which the subject uttered the proposition, like in the case of verbs: *announce*, *say* or *whisper*. Moreover, some verbs like *prefer*, *hope*, *regret* or *be surprised* express the subject's emotional attitude towards the embedded clause.

Interestingly, even if they are very close in terms of meaning, clause embedding predicates do not behave in the same way concerning the types of clauses they can embed. Consider the following examples:

(1) Alfred **knows**...
    a. that Bertrand left.
    b. whether Bertrand left.
    c. who left.
    d. why Bertrand left.
    e. which person left.

(2) Alfred **believes**...
    a. that Bertrand left.
    b. *whether Bertrand left.
    c. *who left.
    d. *why Bertrand left.
    e. *person left.

(3) Alfred **wonders**...
    a. *that Bertrand left.
    b. whether Bertrand left.
    c. who left.
    d. why Bertrand left.
    e. which person left.

(4) Alfred **is surprised**...
    a. that Bertrand left.
    b. *whether Bertrand left.
    c. who left.
    d. *why Bertrand left.
    e. which person left.

Even though all four verbs above play the same syntactic role in the respective sentences, they differ in selectional properties, i.e. certain types of clauses are ac-

cepted by some verbs and not by the others. This observation suggests that the source of this difference is, in fact, the *meaning* of these predicates, which their semantics should capture (Roelofsen and Uegaki, 2021). In Section 1.2 I will discuss the possible approaches that formal semantics can take to accommodate for these differences. However, before proceeding to that part, I will discuss in more depth the behaviour of the clause-embedding predicates and provide some terminology, which I will use in the remainder of this thesis.

The first distinction that has to be made is between *declarative* and *interrogative* clauses. Clauses of the first type are classically understood propositions connected with the main part of the sentence using the particle "that" as in (1-a).[3] Interrogative clauses are questions of certain types like (1-b) - (1-e). *Polar interrogatives* like (4-b) are often distinguished from other interrogatives, as some predicates do not accept them, even though they generally accept interrogative complements. Moreover, it is not the case that any declarative or interrogative sentence can be embedded. For example, performatives like (5) and questions which make use of inversion or an auxiliary verb like (6) seem unfitting to play a role of a clause:

(5)   I now pronounce you husband and wife.

(6)   Did you eat your lunch?

In the literature, the following classification of clause-embedding predicates can be found. Predicates like "know" or "be surprised", which accept declarative and interrogative complements, as in (1) or (4) are called *responsive* (Lahiri, 2002). Predicates like "wonder", which accept only interrogative complements, as in (3) are called *rogative* (Asher, 1987). And predicates like "believe" accept only declarative complements, as in (2) are called *anti-rogative* (Theiler et al., 2019).

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[3]It is interesting to notice that propositions are often defined as "the objects of belief and other 'propositional attitudes' (i.e., what is believed, doubted, etc.)" or as "the referents of that-clauses, and the meanings of sentences"(McGrath and Frank, 2020). Thus the definition of declarative complements may seem circular. For now, I assume that the reader has some intuition about what a proposition is and postpone any discussion of this notion until Section 1.2. Similarly, I will not discuss yet, what I exactly mean by "questions".

Observe that this classification disregards other selectional differences between the verbs. For example, predicates "know" and "be surprised" are both judged responsive, as they can, in principle, embed both types of clauses, even though "be surprised" cannot embed polar interrogatives. This classification is summarised by Table 1.1:

Name	Declaratives	Interrogatives
Responsive	✓	✓
Rogative	✗	✓
Anti-rogative	✓	✗

Table 1.1: Classification of the clause-embedding predicates.

This classification provides us with a puzzle that current state of the art research in clause-embedding predicates aims to solve, which is to characterise these three classes of predicates in terms of their semantic properties. Many recently published works aim to establish generalisations that at least partially characterise these classes, i.e., provide sufficient conditions for a predicate to be a member of some class.[4] In Section 1.4, I present several constraints that were proposed by researchers to at least partially resolve this puzzle. However, to investigate these hypotheses thoroughly, firstly, I will discuss some semantic properties of clause-embedding predicates that are the basis for these generalisations in Section 1.3.

Solving the puzzle represented by Table 1.1 is just the first step toward the ultimate goal that the field of formal semantics wants to reach when it comes to clause-embedding predicates: Provide compositional and universal semantics of clause embedding predicates capturing all their relevant properties.[5] This thesis contributes to the MECORE project, which aims at achieving this goal. In the wording of the authors:

> [The MECORE] project will pursue an integrated approach to investigate the relation and interaction between semantic properties of clause

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[4]Among others: Egré (2008), Spector and Egré (2015), Theiler et al. (2019), Uegaki and Sudo (2019), Roelofsen and Uegaki (2021). Please see the section 1.4 for further discussion.

[5]A further example of an obstacle to achieving that goal is the so-called "whether puzzle", which aims to explain why certain responsive predicates do not accept polar interrogatives (Roelofsen, 2019b).

embedding predicates and their selectional properties, by combining cross linguistic data collection and experimental semantics with the development of unified theoretical analyses (Uegaki et al., 2022).

The focus of this thesis is mainly on the cross-linguistic part of the project. As a native speaker of Polish, I will provide an intensive study of the semantic and selectional properties of the clause-embedding predicates in this language. As the secondary output of this project, I provide a spreadsheet containing around 50 predicates (Appendix A). For each predicate, I analyse around 40 properties that it may satisfy (see Section 1.3.1 and Section 1.3.2). Moreover, I provide detailed linguistic data for each predicate and each property, which justifies the respective entry in the spreadsheet (Appendix B).

A cross-linguistic study is essential for the project's overall goal in two ways. Firstly, an analysis of a predicate or a class of predicates in a different language may provide insight into the meaning of the corresponding predicate(s) in English. For example, take the English predicate "*know*", which has two translations in many languages: one expressing acquaintance relation with an object and another describing agent's propositional knowledge.[6] This behaviour may suggest that the verb "*know*" is ambiguous in English, and its acceptance of both propositional and DP (object) complements, does not require a universal explanation. Secondly, only a cross-linguistic study can ensure the true universality of the postulated semantics. As the use of language is an activity that most human beings engage in, it seems artificial and too narrow to focus on only one (English) version of this practice. Therefore studying the properties of clause embedding predicates in languages other than English can either provide evidence that confirms the existing generalisations or counterexample that challenge them.

It is crucial to consider languages from different groups and families as this ensures broad scope of confirmation of the results. So far, Polish is the only Slavic language that has been analysed in the project, and thus the insights of this thesis are original and relevant to state of the art in the field. Polish is very interesting as it has a rich aspectual morphology which shows that aspect changes may affect the verbs'

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[6]For examples in French: *connaître/savoir*; in German: *kennen/wissen*; in Polish: *zna/wiedzie*.

selectional properties (see e.g. Zuchewicz (2020), Özyıldız (2021)). A more detailed discussion of this phenomenon and can be found in Section 2.2.

1.2 The formal semantics for clause-embedding predicates

In order to formally describe the semantic properties of clause-embedding predicates, we need a mode of representation free of language-specific commitments. To achieve this, we need to represent the essential semantic components of sentences without any commitment to the syntactical structure of the sentence or grammatical nuances of different languages (like prepositions, conjugation, articles, etc.). Thus, before investigating particular classes of the clause-embedding predicates, a discussion of their general semantics is in order. Since we want our semantics to be compositional the following issue arises:

Consider a responsive predicate V (e.g. "to know"). Since V can embed declarative and interrogative complements, its formal semantics should be able to model both cases. Moreover, since the semantics should be compositional, the meaning of each case should be modelled using the meaning of the two components, i.e. the meaning of V and the meaning of the respective complement. However, as Uegaki (2019) observes, the assumption that propositions and questions are expressions of different types is fairly standard in formal semantics. Therefore a semanticist has to explain how one natural language predicate V can take two expressions of different types as arguments? Uegaki (2019) identifies four possible solutions to this problem:[7]

1. **Ambiguity**: Every responsive predicate is ambiguous between the two readings - one that embed declaratives and another that embed interrogatives.

2. **Q-to-P reduction**: Every responsive predicate reduces the meaning of an interrogative complement to the meaning of a declarative complement by some

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[7]Note that none of these solutions actually specify the type of propositions or questions embedded under a predicate. They only describe the relationship between the two types. There is no agreement on the types of the embedded clauses, and therefore, I also do not assume any particular types yet.

extra semantic operator (some being the reduced interrogatives.)

3. **P-to-Q reduction**: Every responsive predicate reduces the meaning of a declarative complement to the meaning of an interrogative complement by some extra semantic operator. Responsive predicates embed only interrogative complements (some being the reduced declaratives).

4. **Uniformity**: Questions and classically understood propositions are of the same type. Responsive predicates embed the complements of this type.

As Uegaki (2019) shows, solutions 1. and 2. are deeply problematic. Appealing to ambiguity seems like an "easy way out", but it requires an extreme assumption, i.e. that all the responsive predicates are ambiguous. Such a claim would require some empirical argument, but there seems to be no other than selectional flexibility of responsive predicates. On the other hand, there are many arguments against this claim.

Spector and Egré (2015) observed that the meaning of the responsive predicates when they embed interrogative clauses is closely related to their meaning when they embed declarative clauses. As an example, we can take the predicate "to know", where for a question, Q "to know Q" means something like "to know the true answer to Q". As an example observe that (7-a) and (7-b) describe exactly the same situation if we know that Bertrand indeed left. Someone who wants to adopt the ambiguity solution has to explain this relation.

(7)   Alfred knows...
    a.   that Bertrand left.
    b.   whether Bertrand left.

Moreover, Uegaki (2019) observes that sentences like (8) that conjoin declarative and interrogative complements under a single predicate perfectly grammatical and well-formed in many languages, Moreover, inserting the second instance of the predicate seems redundant or even ungrammatical. This evidence strongly suggest that the verb "know" is used in the same meaning for both complements. Similar examples

can be created for other responsive predicates. A proponent of the ambiguity solution would have to explain this behaviour.

(8)   a.   Alfred knows that Bertrand left and (?he knows) where he is now.
         b.   Alfred knows that Bertrand left and Ludwig (?knows) which other guests left.
         c.   Alfred knows who will come to the party and (?he knows) that Bertrand will bring some beers.

Moreover, Spector and Egré (2015) point out that predicates which would have a completely different meaning when they embed different types of clauses seem very unnatural. As an example, they give the predicate "to shknow," which means "to know" with a declarative complement and "to wonder" with an interrogative complement. This argument points out that in natural languages, we would have two completely distinct predicates V and W rather than homonymous predicates V_d and V_i.

Following this suggestion, one might be tempted to adopt the Q-to-P reduction solution, which uses an "answerhood operator" to transform a question into a proposition if embedded under a responsive predicate (Uegaki, 2019). This operation reduces an attitude towards a question to an attitude towards a proposition, but an unspecified one. However, as Uegaki (2019) points out, this solution makes two predictions that turn out to be wrong when confronted with certain natural language predicates:

Q-to-P reducibility. The first prediction is that the truth value of a sentence containing an interrogative embedded under a responsive predicate V is completely dependent on the propositions that stand in relation V to the agent. This prediction fails to adequately account for the semantics of the factive predicates like "know" and non-factive presuppositional predicates like "agree". I will only briefly present here the first issue, and for the broader discussion, I refer the reader to the article by Uegaki (2019). Consider the situation (9). In this context both agents knowledge consists of exactly the same propositions. However, the sentence (10-a) is true but the sentence (10-b) is false. Therefore scenarios like (9) are counterexamples to the discussed prediction of the Q-to-P reduction since Alfred and Bertrand has the same

set of "propositional" knowledge, so by Q-to-P reducibility they should have the same "interrogative" knowledge. However, as (10) shows, their "interrogative" knowledge differ.

(9)   There are only two shops in Alfred's neighbourhood. He and Bertrand want to buy some beers for the party. Shop A sells beers, and shop B does not. Alfred believes that one can buy beers at A and neither believes nor disbelieves that they can buy them at B. Bertrand also believes beers can be bought at A, but he also (falsely) believes that one can buy them at B. Other than this we assume Alfred and Bertrand to have the same believes.

(10)   a.   ✓ Alfred knows where one can buy a beer in his neighbourhood.
        b.   ⊥ Bertrand knows where one can buy a beer in Alfred's neighbourhood.

Entailment prediction. Another prediction of the the Q-to-P reduction solution is that any sentence containing an interrogative embedded under a responsive predicate V implies that for some answer to that interrogative (a proposition), the subject stands in a relation V to this answer. This prediction comes out false, according to Elliott et al. (2017) and Uegaki (2019), for the predicates of relevance like "care". Sentence (11-a) does not imply (11-b) because (11-b) seems to presuppose that there exists a concrete person (Bertrand) about whom the subject knows that they left; meanwhile, (11-a) lacks this presupposition and can be true even if Alfred has no idea who left and who did not leave.

(11)   a.   Alfred cares which guests left the party.
        b.   Alfred cares that Bertrand left the party.

Maybe then the P-to-Q solution could work? The core idea of the P-to-Q reduction was presented by Uegaki (2015) which is to take a proposition and shift its type to the type of questions. Since most current semantic theories of question agree that questions should be formally represented by sets of propositions and only disagree on what precisely these sets should look like, then it is safe to assume that, indeed,

questions are of the type "sets of propositions" (see e.g. Roelofsen, 2019a). The type shifting happens using the "identity type shifter", which takes a proposition and returns a singleton set containing exactly this proposition, i.e. a proposition P after the type shift becomes the "question" $\{P\}$. Observe that this "question" is not a natural language example of a question as it does not pose any issue to be resolved. The type shifter preserves the proposition's meaning and only changes its type to allow embedding under a predicate (Uegaki (2019)).

Uegaki (2019) claims that this solution is unproblematic. I agree that there is no clear counterexample against the P-to-Q solution, similar to those presented against the first two approaches. As suggested to me by Floris Roelofsen in a personal conversation, the predictions that P-to-Q reduction makes are not as strong as those of the Q-to-P approach. The P-to-Q reducibility prediction says that the truth value of a sentence with an embedded declarative depends entirely on the truth of the embeddings of the corresponding interrogative complements. The entailment prediction is that if the subject is in a relation V to a proposition, then for some question that corresponds to this proposition, the subject stands in a relation V to this question. As indicated above, the "corresponding question" is the singleton set containing the proposition in both cases. Thus these predictions are almost trivially true, as no "natural language question" can be seen as a proper counterexample to them.

However, I will argue that the Uniformity solution to the issue of responsive predicates is at least as good as the P-to-Q entailment and I will adopt it for the purpose of this thesis. But first, let's discuss the Uniformity solution.

For this thesis, I will adopt the uniformity approach presented by Theiler et al. (2018, 2019). I will assume that interrogatives and declaratives or questions and classically understood propositions are of the same type. They are represented by sets of sets of possible worlds, i.e. they are of the question type, which is: $\langle\langle s, t\rangle, t\rangle$.[8] In this framework, declaratives correspond to singleton sets of propositions, i.e. sets that contain only one set of possible worlds as discussed by inquisitive semantics

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[8]A more involved study of the exact type of of the complements lies outside of the scope of this project. Some researchers like Liefke (2021) postulate that, to accommodate for other types of complements in a uniform way, it should be more involved e.g. object-centered questions like $\langle\langle s\langle se, t\rangle\rangle t\rangle$. As mentioned before the exact type of the complement does not matter for the correctness of a solution, as long as it is the same for propositions and questions.

(Ciardelli et al., 2018). In a sense, it corresponds to P-to-Q reduction, as in both of these solutions, a classically understood proposition P is represented as $\{P\}$. The difference is that in the Uniformity approach it is always the case and in the P-to-Q only when the proposition is embedded under a responsive predicate (Roelofsen, 2019a, p.14).[9]

It is already clear that the explanation of the responsiveness puzzles is the same for P-to-Q reduction and the Uniformity solution. Responsive predicates only accept questions, and classically understood propositions are actually of type question when embedded under a responsive predicate. As Roelofsen (2019a) observes, the difference in how these solutions reach this explanation causes different drawbacks; the P-to-Q solution has to explain why some predicates (rogative predicates) that embed questions do not accept declarative complements, i.e. do not have the type shifter in their semantics. The Uniformity solution has to explain why some predicates (anti-rogative predicates) do not embed questions, i.e. accept only singleton sets of sets of worlds. The P-to-Q solution explains anti-rogativity by type mismatch which cannot be done for rogative predicates (Roelofsen, 2019a). The Uniformity solution has an easy way out for rogative predicates, as inquisitive semantics provide a reasonable formal interpretation of the modalities expressed by those predicates (Ciardelli et al., 2018, p.155-159).

There are two reasons why I will adopt the uniformity solution in my thesis. They are not to be seen as proper arguments against the P-to-Q solution but may potentially be developed to argue for the superiority of the Uniformity approach:

Uniformity The Uniformity solution is preferred as it treats declarative and interrogative sentences in a uniform way. Moreover, it treats all the clause-embedding predicates in a uniform way as it does not require type shifting machinery. Adopting the Uniform solution we do not have to commit to the type shifter's existence when discussing the semantics of a particular clause-embedding predicate. This is important as many predicates that at first glance seem to be anti-rogative, in some

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[9]Theoretically, it would be possible to define a uniformity solution analogical to the O-to-P reduction where all the embedded clauses have the type of propositions. However, this position does not make much sense for two reasons: 1. Every counterexample to Q-to-P reduction is also a counterexample to this solution. 2. There is no good formal approach to model questions as propositions and usually they are modelled as sets of propositions.

contexts, can embed questions. Consider the observations in (12) about the verbs "believe", "be certain", "think", "hope" and "doubt" made by respectively: Roberts (2019), Mayr (2019), Özyıldız (2021), White (2021) and myself:

(12) a. Ursula can't believe who won the election.
      b. John isn't certain whether Mary smokes.
      c. I am thinking who to invite to the party.
      d. I was hoping whether you are able to guide me.
      e. Now, nobody doubts who is the best player in the world.
      f. "Launching his bid to become Labours candidate in the race on Thursday, Lloyd said: "Nobody doubts who the mayor of London is; nobody doubts who speaks for Scotland...".[10]

The proponents of the P-to-Q solution have to explain those predicates' behaviour. They either need to claim that these predicates, in principle, can embed questions, but they can't do it in a neutral context or that these "special contexts" introduce the type shifting. The first solution reduces to doing the very same thing as the Uniform solution has to do with all the anti-rogative predicates, i.e. explain why they can't embed interrogatives in neutral contexts. Since we keep finding new contexts which show that more and more predicates can embed interrogatives, the proponents of the P-to-Q solution would indeed have to find such an explanation for all the anti-rogative predicates. If the P-to-Q solution has the same drawbacks as the Uniform solution, then it is reasonable to adopt the simpler and more universal, Uniform solution. The claim that "special contexts" introduce the type shifting, seems very implausible, as for different predicates, different contexts allow for embedding of interrogatives.

Explainability The main goal of this thesis and the whole MECORE project is to provide some insight, or ideally resolve, the puzzle presented in table 1. Therefore to characterise the three classes of predicates (responsive, anti-rogative and rogative) in terms of their semantic properties. The responsiveness puzzle presented in this chapter is just a first step that needs to be done to provide the formal semantics

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[10]https://www.theguardian.com/uk-news/2016/feb/11/labour-tony-lloyd-greater-manchester-mayoral-bid-devolution [accesed: 13.05.2022] Found using the *English corpus of News on the Web* (Davies, 2016)

of those predicates within any framework. Since type mismatch is not a semantic property (or at least not an explanatory one), it cannot be a characterisation of the anti-rogative class. Therefore, in light of this thesis, adopting a simpler solution to the responsiveness puzzle that provides better tools for the semantic explanation seems to be a better (or at least as good) strategy.

Solving the puzzle of responsiveness allows for a formal representation of the sentences containing clause-embedding predicates. I present such a formalism in the next section. It will allow to formally represent the relevant semantic properties of clause-embedding predicates without language-specific commitments.

1.3   Properties of the clause-embedding predicates

This section discusses semantic and selectional properties of clause-embedding predicates. It is somewhat technical as it contains many definitions and terminology. Going through it may be tedious for the reader, but it is necessary to present the terminological toolkit. The list of the presented properties is by no means exhaustive, as it contains only those properties that are investigated in the MECORE questionnaire by Uegaki et al. (2022) and that are relevant for the constraints and generalisations presented in the Section 1.4. Many of the properties considered in this section were identified in the literature some time ago under different names (see e.g. the paper by Asher (1987) or the book by Lahiri (2002)). However, I would like to stay consistent with the terminology of the MECORE project, and thus I discuss the properties as considered in the questionnaire.

The MECORE questionnaire analyzes 16 semantic properties of clause-embedding predicates, some of which consist of several sub-properties. I discuss them in Section 1.3.1. The number of selectional properties depends on the number of the types of clauses that exist in the specific language. For Polish, I analyse 18 different types of clauses and I discuss them in Section 1.3.2. The properties are represented by the test sentences or pairs of sentences in the questionnaire. The consultants are asked to judge the grammaticality of the test sentence or asses the conversational validity

of inference between the test sentences to determine whether a predicate has the property in question. The specifics of these tasks are discussed in Chapter 2

The linguistic database in Appendix B contains the names of the properties, the evaluated test sentences translated to Polish as well as the corresponding English translations. The remainder of this section discusses all the properties formally and provides the relevant test sentences in English and examples of English verbs that satisfy them.

1.3.1 Semantic properties

To achieve a mode of representation free of the language-specific commitments, we need to represent the essential components of sentences without any commitment to the order of these components in the actual sentence or the additional elements (like prepositions, conjugation, articles, etc.) needed to construct the sentence in a given language.[11] Since providing a new mode of representation of the properties of clause-embedding predicates is not the main point of this thesis, I make several simplifying assumptions, and I will not dive too deep into the details. However, a proper formal framework for clause embedding predicates remains an open area of study and a proper logical formalism with syntax and semantics should be developed to both allow to prove interdependenceies between the semantic properties (see Chapter 3) and ensure the soundness of the methodology of the research in the area of the clause-embedding predicates.

Firstly, let's represent a set of the semantic components of a sentence as $\ulcorner \alpha_1, \ldots \alpha_n \urcorner$. This notation can be seen as a "recipe" that a native speaker can use to construct a sentence in their own language that has the required components and thus the desired meaning where $\alpha_1, \ldots \alpha_n$ are the semantic "ingredients" that have to be used in the

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[11]The only requirement that a natural language needs to satisfy to be represented by the formal language discussed below, is that it needs to have clause-embedding predicates. I am not aware of natural languages that do not satisfy this requirement. Moreover, even if such languages exist, they are, for obvious reasons, of no interest to this thesis, even thought they may be relevant for the study of caluse-embedding predicates in general.

resulting sentence.[12] As mentioned above, the clause-embedding predicates express a relation between a subject and a (potentially inquisitive) proposition. Therefore, let V represent a clause-embedding predicate, and let $\neg V$ represent a clause-embedding predicate that is the negated predicate V. V will take two arguments, possibly by a stepwise procedure, one on the left side and one on the right side, i.e. the subject of the sentence and the embedded clause.

Let s represent an arbitrary subject of a sentence. The subject can be either a proper name like "Ann" a noun phrase like "Ann and Peter" or a pronoun like "she". It can also be an *implied* subject that is syntactically absent in a sentence.[13] Since the type of the subjects accepted by the predicates differ from predicate to predicate, I will not specify exactly the type of s. However, for most predicates considered in the questionnaire and all the test sentences, the left-side argument of the predicate (subject) is of type $\langle e \rangle$.

Let d represent an arbitrary declarative clause and q an arbitrary interrogative clause. Observe that d can in principle represent a complex logical formula. Thus, whenever it is relevant, we can use logical connectives and propositional variables like p to modify it. Let a_q represent an answer to the issue raised by q. Observe that, since we assume the uniformity solution to the responsiveness puzzle, all these expressions are of the same type. We distinguish between them only for convenience of representation, as this is exactly the language of the propositional inquisitive logic (Ciardelli et al., 2018).[14] Therefore we assume that the right-side argument of a clause-embedding predicate is $\langle \langle s, t \rangle, t \rangle$.

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[12]Please note that Uegaki (2019) and Roelofsen and Uegaki (2021) use a similar notation which is slightly different from the one presented here.

[13]In English any declarative sentence needs a syntactically present subject to be grammatically correct. However in other languages the subject may be known from the context. Consider the following example:

(13)   Wie,   e   tu   jestemy.
        Knows, that here we are.
        "(s)he knows that we are here".

[14]For example d can be defined as any P such that $P = \bigcup P$, q as any P such that $P \neq \bigcup P$ and a_q can be defined as an $X \in q$. For more details on the inquisitive logic please consult the book by Ciardelli et al. (2018)

Now, define the following to be a language of complements which is exactly the language of the propositional inquisitive logic:

$$\varphi ::= d \mid q \mid a_q \mid \neg\varphi \mid \varphi \rightarrow \varphi$$

The following to be the language of predicates:

$$\mathcal{V} ::= V \mid \neg\mathcal{V}$$

And thus the following to be the language of all expressions

$$\alpha_i ::= \varphi \mid \mathcal{V} \mid s\mathcal{V} \mid \mathcal{V}\varphi \mid s\mathcal{V}\varphi$$

For example let V be the predicate "to know", let a represent Alfred and let p represent a clause "that Bertrand left". Then $\ulcorner aKp \urcorner$ represents all the sentences which mean: "Alfred knows that Bertrand left.". Since we defined s and d (or q or a_q) to be arbitrary, then there are also expressions of the form $\ulcorner sKd \urcorner$ which quantify over all sentences which express that an arbitrary subject s stands in a relation K to a proposition d, i.e. both "Alfred knows that Bertrand left." and "Ludwig knows that the sky is blue." are sentences that are of the semantic form $\ulcorner sKd \urcorner$.

Therefore we can treat the expressions $\ulcorner \alpha_1, \ldots \alpha_n \urcorner$ as properties of sentences and, by adding logical connectives, we achieve classical first order logic, where quantifiers range over the sentences of a language. Observe that this mode of representation is not a formal calculus. There are no logical connectives and no inference rules that would determine the relation between expressions. This language is also not a categorial (or any other) grammar since there are no rules of composition, and the order of the set elements does not matter. It expresses a property of a sentence or, in other words, a subset of the set of all well-formed sentences of a natural language.

Let $\ulcorner \tau \urcorner \Rightarrow \ulcorner \kappa \urcorner$ be a shorthand notation for a formula that says: If a sentence that satisfy τ is true then a sentence that satisfy κ is true.[15] Obviously, if τ contains s d, q or a_q it range over all sentences some (very general) form e.g. over all the sentences of

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[15]Note that this representation assumes that there is a truth predicate in the language, which,as we know since Tarski (1944), is philosophically problematic. To address this issue I simply assume that the truth predicate comes from the metalanguage.

the form $\ulcorner sKd \urcorner$. It is impossible to verify such a general claim, since it is infeasible to iteratively check all the sentences that satisfy τ. However, since languages tend to behave in a uniform way, we can accept these claims in light of strongly confirming evidence and lack of falsifying evidence, keeping in mind that they can eventually be falsified in the future.

The reminder of this section is divided into three parts; the first one presents the properties of the predicates that can embed declarative clauses, the second of those that can embed interrogative clauses, and the last one of those that accept both types of complements. For each property, I provide a description in plain English, a formal representation using the formalism described above and an example which illustrates the actual test from the MECORE questionnaire by Uegaki et al. (2022).[16]

The following semantic properties are analysed in the MECORE questionaire by Uegaki et al. (2022):

Properties of the predicates that can embed declarative clauses

Definition 1. *(Veridicality w.r.t declaratives) Predicate V is veridical with respect to declaratives if and only if a sentence which relates a subject s to a declarative complement d using V implies the complement d:*

$$\ulcorner sVd \urcorner \Rightarrow \ulcorner d \urcorner$$

Example 1. *The English predicate "to know" is veridical with respect to declaratives as (14-a) implies (14-b):*

(14)   a.   Alfred knows that Bertrand left.
            b.   Bertrand left.

Definition 2. *(Anti-veridicality w.r.t declaratives)Predicate V is anti-veridical with respect to declaratives if and only if a sentence which relates a subject s to a declarative*

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[16]Please note that some pairs of properties constitute only one data point in the database. For instance, for each predicate that can embed declarative complements, the properties of veridicality and anti-veridicality constitute one data point with three possible values: "veridical", "anti-veridical", "neither".

complement d using V implies the negation of the complement:

$$\ulcorner sVd \urcorner \Rightarrow \ulcorner \neg d \urcorner$$

Example 2. *The English predicate "to be wrong" is anti-veridical with respect to declaratives as (15-a) implies (15-b):*

(15)   a.   Alfred is wrong that Bertrand left.
        b.   Bertrand did not leave.

Definition 3. *(Complement confirmation) Predicate V allows for complement confirmation if and only if a sentence which relates a subject s to a declarative complement d using V can be meaningfully conjoined with the complement d:*

$$[\ulcorner sVd, \ d \urcorner \not\Rightarrow \bot] \wedge [\neg (\ulcorner sVd \urcorner \Rightarrow \ulcorner d \urcorner)]$$

Example 3. *The English predicate "to know" does not allow for complement confirmation as (16-a) sounds redundant and the predicate "to be wrong" does not allow for complement confirmation as (16-b) sounds contradictory. However, the English predicate "to believe" does as (16-c) sounds neither redundant nor contradictory:*

(16)   a.   Alfred knows that Bertrand left, and indeed Bertrand left.
        b.   Alfred is wrong that Bertrand left, but in fact Bertrand left.
        c.   Alfred believes that Bertrand left, and indeed Bertrand left.

Observe that here we make use of the freedom that the adapted notation gives us. It is possible to add the word "indeed" or interpret the conjunction using either "and" or "but", and this still results in a sentence that has the required property. This is a big advantage of the notation as it allows us to pinpoint the exact behaviour of the predicates that we care about and give the native speaker freedom to change other variables that may have an influence on their judgement.

Definition 4. *(Complement cancellation) Predicate V allows for complement cancellation if and only if a sentence which relates a subject s to a declarative complement*

d using V can be meaningfully conjoined with the negation of the complement d:

$$[\ulcorner sVd,\ \neg d \urcorner \not\Rightarrow \bot] \wedge [\neg(\ulcorner sVd \urcorner \Rightarrow \ulcorner \neg d \urcorner)]$$

Example 4. *The English predicate "to know" does not allow for complement confirmation as (17-a) sounds contradictory and the predicate "to be wrong" does not allow for complement confirmation as (17-b) sounds redundant. However, the English predicate "to believe" does allow it, as (17-c) sounds neither redundant nor contradictory:*

(17)   a.   Alfred knows that Bertrand left, but in fact Bertrand did not leave.
       b.   Alfred is wrong that Bertrand left, and indeed Bertrand did not left.
       c.   Alfred believes that Bertrand left, but in fact, Bertrand did not leave.

Definition 5. *(Complement projection through negation) Predicate V is complement projective through negation if and only if a sentence which relates a subject s to a negation of a declarative complement d using V implies the complement d:*

$$\ulcorner s\neg Vd \urcorner \Rightarrow \ulcorner d \urcorner$$

Example 5. *The English predicate "to know" is complement projective through negation as (18-a) implies (18-b):*

(18)   a.   Alfred doesn't know that Bertrand left.
       b.   Bertrand left.

Definition 6. *(Complement reversal through negation) Predicate V is complement reversal through negation if and only if a sentence which relates a subject s to a negation of a declarative complement d using V implies the negation of the complement d:*

$$\ulcorner s\neg Vd \urcorner \Rightarrow \ulcorner \neg d \urcorner$$

Example 6. *The English predicate "to be right" is complement reversal through negation as (19-a) implies (19-b):*

(19)   a.   Alfred is not right that Bertrand left.

b.   Bertrand did not leave.

Definition 7. *(Neg-raising) Predicate V is neg-raising if and only if a sentence which relates a subject s to of a declarative complement d using the negation of V implies the sentence, in which the negation negates the complement d instead of the predicate V:*

$$\ulcorner s \neg V d \urcorner \Rightarrow \ulcorner s V \neg d \urcorner$$

Example 7. *The English predicate "to believe" is neg-raising as (20-a) implies (20-b):*

(20)   a.   Alfred doesn't believe that Bertrand left.
        b.   Alfred believes that Bertrand did not leave.

One could argue that the property of neg-raising is not a semantic property but rather occurs due to some pragmatic inference, as the entailment in question is easily cancellable. For example, (21-a) does not imply (21-b). But, since this behaviour of certain predicates has a source in their meaning, it is still possible to refer to the underlying semantic mechanism as a "semantic property" of the particular verb. This judgement is supported by the fact that generalisations which refer to neg-raising use this underlying semantic mechanism as an explanation rather than neg-raising *per se* (Theiler et al., 2019).

Example 8. *The English predicate "to believe" is neg-raising as (21-a) implies (21-b):*

(21)   a.   Alfred doesn't believe that Bertrand left. In fact, Alfred does not know
              that Bertrand even exists.
        b.   Alfred believes that Bertrand did not leave.

For any agent (subject) s define a *likelihood relation* $\leq_s$ such that it is a partial order on the set of all propositions but is not necessarily connected. For any two propositions p and q; $p \leq_s q$ holds if and only if s consider q at least as likely to be true as p. Other relations like $<_s$ or $=_s$ are defined as usual.

Definition 8. *(Likelihood implication with respect to declaratives) Predicate V has a likelihood implication if and only if a sentence which relates a subject s to a declarative*

complement d using V implies that s believes that the complement d is more likely then its negation:

$$\ulcorner sVd \urcorner \Rightarrow (\ulcorner d \urcorner >_s \ulcorner \neg d \urcorner)$$

Definition 9. *(Likelihood compatibility with declaratives) Predicate V is compatible with likelihood scenarios if and only if a sentence which relates a subject s to a declarative complement d using V can be truthfully asserted if s finds the complement more likely then its negation:*

$$\ulcorner sVd \urcorner \not\Rightarrow (\ulcorner d \urcorner \leq_s \ulcorner \neg d \urcorner)$$

Unlikelihood implication and *compatibility* as well as *equal likelihood implication* and *compatibility* are defined analogically.

Example 9. *The English predicate "to believe" has a likelihood implication as (22-a) implies (22-b):*

(22)   a.   Alfred believes that Bertrand left.
       b.   Alfred considers more likely that Bertrand left then that Bertrand did not leave.

Example 10. *The English predicate "to say" has no likelihood implications and is compatible with likelihood, unlikelihood and equal-likelihood scenarios as (23-a) does not imply (23-b), (23-c) or (23-d):*

(23)   a.   Alfred said that Bertrand left.
       b.   Alfred considers more likely that Bertrand left then that Bertrand did not leave.
       c.   Alfred considers more likely that Bertrand did not leave then that Bertrand left.
       d.   Alfred considers that Bertrand left and that Bertrand did not leave equally likely.

For any agent (subject) s define a *certainty modality* $\Box_s$ such that it is a modality of a doxastic single-agent $KD45$ logic i.e. such that the relation of the Kripke models is always serial, transitive and euclidean. (Baltag and Renne, 2016)

Definition 10. *(Certainty implications with respect to declaratives) Predicate V has:*

- *a certainty implication iff: a sentence which relates a subject s to a declarative complement d using V implies that s is certain that the complement is true:*

$$\ulcorner sVd \urcorner \Rightarrow \Box_s \ulcorner d \urcorner$$

- *a counter-certainty implication iff: a sentence which relates a subject s to a declarative complement d using V implies that is certain that the negation of the complement d is true:*

$$\ulcorner sVd \urcorner \Rightarrow \Box_s \ulcorner \neg d \urcorner$$

- *an uncertainty implication iff: a sentence which relates a subject to a declarative complement using V implies that the subject is uncertain whether the complement is true:*

$$\ulcorner sVd \urcorner \Rightarrow \neg \Box_s \ulcorner d \urcorner \wedge \neg \Box_s \ulcorner \neg d \urcorner$$

Definition 11. *(Certainty-compatibilies with respect to declaratives) Predicate V is compatible with:*

- *certainty scenarios if and only if a sentence which relates a subject s to a declarative complement d using V can be truthfully asserted if s is certain that the complement d is true:*

$$\ulcorner sVd \urcorner \not\Rightarrow \neg \Box_s \ulcorner d \urcorner$$

- *counter-certainty scenarios if and only if a sentence which relates a subject s to a declarative complement d using V can be truthfully asserted if s is certain that the negation of the complement d is true:*

$$\ulcorner sVd \urcorner \not\Rightarrow \neg \Box_s \ulcorner \neg d \urcorner$$

- *uncertainty scenarios if and only if a sentence which relates a subject s to a declarative complement d using V can be truthfully asserted if the subject is*

uncertain whether the complement d is true:

$$\ulcorner sVd \urcorner \not\Rightarrow \Box_s \ulcorner d \urcorner \vee \Box_s$$

Example 11. *The English predicate "to know" has a certainty implication as (24-a) implies (24-b):*

(24) a. Alfred knows that Bertrand left.
      b. Alfred is ccertain that Bertrand left.

Example 12. *The English predicate "to say" has no certainty implications and is compatible with certainty, counter-certainty and uncertainty scenarios as (25-a) does not imply, but is compatible with (25-b), (25-c) and (25-d):*

(25) a. Alfred said that Bertrand left.
      b. Alfred is certain that Bertrand left.
      c. Alfred is certain that Bertrand did not leave, but he lied to us.
      d. Alfred is uncertain whether Bertrand left.

For any agent (subject) s define a *preference relation* $\preceq_s$ such that it is a partial order on the set of all propositions but is not necessarily connected. For any two propositions p and q; $p \preceq_s q$ holds if and only if s consider q at least as likely to be true as p. Other relations like $<_s$ or $\approx_s$ are defined as usual.

Definition 12. *(Preference implication with respect to declaratives) Predicate V has a preference implication if and only if a sentence which relates a subject s to a declarative complement d using V implies that s prefers the possibility that the complement d true over the possibility that its negation is true:*

$$\ulcorner sVd \urcorner \Rightarrow (\ulcorner d \urcorner \succ_s \ulcorner \neg d \urcorner)$$

Definition 13. *(Preference compatibility with respect to declaratives) Predicate V is compatible with preference scenarios if and only if a sentence which relates a subject s to a declarative complement d using V can be truthfully asserted if the subject prefers*

the possibility that the complement true over the possibility that its negation is true:

$$\ulcorner sVd \urcorner \nRightarrow (\ulcorner d \urcorner \preceq_s \ulcorner \neg d \urcorner)$$

Opposition implication and *compatibility* as well as *indifference implication* and *compatibility* are defined analogically.

Example 13. *The English predicate "to be happy" has a preference implication as (26-a) implies (26-b):*

(26)   a.   Alfred is happy that Bertrand will leave.
        b.   Alfred prefers the possibility that Bertrand will leave over the possibility that Bertrand will stay.

Example 14. *The English predicate "to say" has no preference implications and is compatible with preference, opposition and indifference scenarios as (27-a) does not imply (27-b), (27-c) or (27-d):*

(27)   a.   Alfred said that Bertrand will leave.
        b.   Alfred prefers the possibility that Bertrand will leave over the possibility that Bertrand will stay.
        c.   Alfred prefers the possibility that Bertrand will stay over the possibility that Bertrand will leave.
        d.   Alfred is indifferent as to whether Bertrand will leave or not.

For a declarative complement d let's use d_a to denote the complement with an adverbial phrase like "in the morning" or "on Monday" and the superscript x^F to mark focus on some part of a sentence. For instance d_{aF} has the focus on the adverbial phrase. In the natural language examples, I will use capitalisation to mark focus.

Definition 14. *(Focus sensitivity) Predicate V is focus sensitive iff a sentence in which the predicate V relates a subject s to a declarative complement, which contains an adverbial phrase with focus (d_{aF}) implies the sentence in which the predicate V*

relates s to the same declarative complement d, but without the adverbial phrase:

$$\ulcorner d_{a^F} \urcorner \not\Rrightarrow \ulcorner sVd \urcorner$$

Example 15. *The English predicate "to decide" is focus sensitive as (28-a) does not imply (28-b):*

(28)   a.   Alfred decided that Bertrand will teach logic on MONDAY.
        b.   Alfred decided that Bertrand will teach logic.

Example 16. *The English predicate "to know" is not focus sensitive as (29-a) implies (29-b):*

(29)   a.   Alfred knows that Bertrand will teach logic on MONDAY.
        b.   Alfred knows that Bertrand will teach logic.

However, as Uegaki et al. (2022) indicate, certain predicates (like deny and be unaware), the condition for focus sensitivity may fail to hold even if the focus is not specified. This is the case predicates are not *Upward-Entailing* when the embedded clause does not contain focus. For instance, the predicate "know" is *Upward-Entailing* as the inference (30) holds but "deny" is not as (31) is not a valid inference. Therefore, an additional test is needed, where the test sentence now has Bertrand in focus instead of Monday, i.e. of the form: $\ulcorner s_F V d_a \urcorner \not\Rrightarrow \ulcorner sVd \urcorner$

Definition 15. *(Upward-Entailing) A predicate V is Upward-Entailing iff for any sentences φ and ψ such that $\varphi \models \psi$: if s is in a relation V to φ then s if s is in a relation V to ψ:*

$$if \ulcorner sV\varphi \urcorner \ and \ \varphi \models \psi \ then \ulcorner sV\psi \urcorner$$

(30)   Alfred knows that Bertrand drank Belgian beer.
        $\rightsquigarrow$ Alfred knows that Bertrand drank beer.

(31)   Alfred denies that Bertrand drank Belgian beer.
        $\not\rightsquigarrow$ Alfred denies that Bertrand drank beer.

For every Upward-Entailing predicate, the MECORE questionnaire provides a test like (32) and asks to evaluate both the first and the second condition on focus sensitivity. The following evaluation instruction are provided in the questionnaire (Uegaki et al., 2022):

- If your answer for the first test was compatible with not and your answer to the second was always implies, then the predicate is focus sensitive.

- If your answer to both the first and the second test was compatible with not, then the predicate is not focus sensitive.

- If your answer to the first test was always implies, then the predicate is not focus sensitive and there should have been no need to run the second test. If this was your answer, something unexpected is happening. Please flag it.

(32)   a.   Alfred denies that BERTRAND will teach logic on Monday.
         b.   Alfred denies that Bertrand will teach logic.

Let $\uparrow$ be an adverb like the English "very much" that modifies the intensity or degree of the attitudes or activities expressed by the predicates. Define the relation $\leq$ to describes some ordering on the in intensity or degree of the attitudes expressed by the predicates.

Definition 16. *(Gradability w.r.t declaratives) Predicate V is gradable with respect to declaratives iff for two subjects such that $s_1 \neq s_2$ and two declarative complements such that $d_1 \not\equiv d_2$ it is possible to correctly form the following sentences:*[17]

$$\ulcorner s \uparrow V d \urcorner$$
$$\ulcorner s_1 V d \urcorner < \ulcorner s_2 V d \urcorner$$
$$\ulcorner s V d_1 \urcorner < \ulcorner s V d_2 \urcorner$$

Example 17. *The English predicate "to be happy" is gradable with respect to declaratives as, (33-a), (33-b) and (33-c) are well-formed and meaningful sentences of English.*

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[17]Consult the examples to see how the sentences of these forms look like.

(33)   a.   Alfred is very happy that Bertrand left.
        b.   Alfred is happy that Bertrand left more than Ludwig is.
        c.   Alfred is happy that Bertrand left more than that Ludwig stayed.

For any agent (subject) s define a *doxastic modality* B_s such that it is a modality of a single-agent $KD45$ logic i.e. such that the relation of the Kripke models is always serial, transitive and euclidean. (Baltag and Renne (2016)) This modality can be used to represent the set of beliefs of the agent.

Properties of the predicates that can embed interrogative clauses

Definition 17. *(Belief entailment w.r.t interrogatives) Predicate V is belief-entailing with respect to interrogatives if and only if a sentence which relates a subject s to an interrogative complement q using V implies for an arbitrary answer a_q to q the subject believes that a_q is true:*

$$\ulcorner sVq \urcorner \Rightarrow B_s \ulcorner a_q \urcorner$$

Example 18. *The English predicate "to know" is belief entailing with respect to interrogatives as (34-a) implies (34-b) and (35-a) implies (35-b):*

(34)   a.   Alfred knows whether Bertrand left.
        b.   Alfred knows (believes) that Bertrand left or Alfred knows (believes) that Bertrand did not leave.

(35)   a.   Alfred knows where Bertrand went.
        b.   About some place a, Alfred knows (believes) that Bertrand went to a.

Definition 18. *(Ignorance entailment w.r.t interrogatives)Predicate V is ignorance-entailing with respect to interrogatives if and only if a sentence which relates a subject s to an interrogative complement q using V implies that s is ignorant with respect q, i.e. that there is no answer a_q to q such that:*

$$\ulcorner sVq \urcorner \Rightarrow B_s \ulcorner a_q \urcorner$$

Example 19. *The English predicate "to wonder" is ignorance entailing with respect to interrogatives as (36-a) implies (36-b):*

(36)   a.   Alfred wonders whether Bertrand left.
        b.   Alfred believes neither that Bertrand left nor that Bertrand did not leave.

Definition 19. *(Gradability w.r.t interrogatives) Predicate V is gradable with respect to interrogatives iff for $s_1 \neq s_2$ and $q_1 \not\equiv q_2$:*

$$\ulcorner s \uparrow V q \urcorner$$
$$\ulcorner s_1 V q \urcorner < \ulcorner s_2 V q \urcorner$$
$$\ulcorner s V q_1 \urcorner < \ulcorner s V q_2 \urcorner$$

are all well-formed and meaningful sentences.

Example 20. *The English predicate "to care" is gradable with respect to interrogatives as, (37-a), (37-b) and (37-c) are well-formed and meaningful sentences of English.*

(37)   a.   Alfred cares very much who came to the party.
        b.   Alfred cares who came to the party more than Ludwig does.
        c.   Alfred cares who came to the party more than what food was served.

Properties of the responsive predicates

Definition 20. *(Q-to-P veridicality) Predicate V is Q-to-P veridical if and only if a sentence which relates a subject s to an interrogative complement q using V implies that the subjects s is in a relation V to the true answer to q, i.e. for the true answer a_q to q:*
$$\ulcorner s V q \urcorner \Rightarrow \ulcorner s V a_q \urcorner \wedge \ulcorner a_q \urcorner$$

Example 21. *The English predicate "to know" is Q-to-P veridical as (38-a) implies (38-b):*

(38)   a.   Alfred knows whether Bertrand left. Bertrand did not leave.

b.   Alfred knows that Bertrand did not leave.

Definition 21. *(Q-to-P distributivity) Predicate V is Q-to-P veridical if and only if a sentence which relates a subject s to an interrogative complement q using V implies that the subjects is in a relation V to an answer to q, i.e. for an answer a_q to q:*

$$\ulcorner sVq \urcorner \Rightarrow \ulcorner sVa_q \urcorner$$

Example 22. *The English predicate "to announce" is Q-to-P distributive as (39-a) implies (39-b):*

(39)   a.   Alfred announced who left the party.
        b.   About some guest a Alfred announced that a left the party.

Definition 22. *(P-to-Q distributivity) Predicate V is P-to-Q distributive if and only if a sentence uses V to relate a subject s to of a declarative complement a_q such that this complement is an answer to the question q implies that the subject is in the relation V to q, i.e. for an answer a_q to q:*

$$\ulcorner sVa_q \urcorner \Rightarrow \ulcorner sVq \urcorner$$

Example 23. *The English predicate "to know" is P-to-Q distributive as (40-a) implies (40-b):*

(40)   a.   About some guest a Alfred announced that a left the party.
        b.   Alfred announced who left the party.

Additionally, the MECORE questionnaire analyses the following property of all predicates:

Definition 23. *(Intransitive use) A predicate has intransitive use if and only if:*

$$\ulcorner sV \urcorner$$

is a well-formed and meaningful sentence outside of any context.

Example 24. *The English predicate "to be happy" has intransitive use as (41) is a well-formed and meaningful sentence in English.*

(41)   Alfred is happy.

1.3.2   Selectional properties

The main question regarding the selectional properties of the verbs is the puzzle presented in Section 1.1 in the Table 1.1, i.e. how to explain the difference in the behaviour of the clause-embedding predicates concerning interrogative and declarative complements? However, as already indicated, the predicates do not behave uniformly over the complements in these classes. This section aims to discuss some sub-classes of complements that can yield new, interesting puzzles that require an explanation. Note that selectional properties vary from language to language, as they have different morphology and grammar and thus allow for the existence of different types of complements. This section will discuss several complement types in English used in the MECORE project as a starting point for investigating the selectional properties of the clause-embedding predicates in other languages.

The first distinction within the class of interrogative clauses needs to be made between the *polar*, *alternative* and *constituent* complements. Polar complements *always* divide the logical space into two parts. For example, the clause (42-a) is polar as it means that Alfred either knows that Bertrand left or that Bertrand did not leave. Similarly, the clause (42-b) is polar as it means that Alfred either knows that Bertrand drank beer or that Bertrand drank wine.On the other hand, clauses (42-d) and (42-e) are non-polar as there might be multiple people about which Alfred knows that they did or did not leave.[18] Alternative clauses contain a disjunction and thus give several options to choose from, like (42-b) and (42-c). If exactly two options are given, (as in (42-b)) then an alternative clause is also a polar clause. Constituent questions are those that do not specify the options to choose from explicitly. In

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[18]In principle, the non-polar complements can also divide the logical space into two parts. Imagine a (very sad) situation in which only one person - Bertrand - was at the party. In this case, knowing who left boils down to knowing whether Bertrand left.

English, they usually start with a wh-word like "who", "which", "what" or "where". The complements (42-d) and (42-e) are examples of the constituent clauses.

(42)   Alfred knows ...
      a.   whether Bertrand left.
      b.   whether Bertrand drank beer or wine.
      c.   whether Bertrand drank beer or wine or vodka.
      d.   which person left.
      e.   who left.

Within the class of constituent clauses we distinguish between the *discourse-linked* (d-linked) like (42-d), which imply the existence of a set of object that are relevant in the discourse; in this case it is a set of concrete people (who e.g. were at the party), and *non-discourse-linked* like (42-e) which do not have this implication (Pesetsky, 1987). We can also distinguish polar and constituent clauses "with main clause syntax"; (43-a) and (43-b) are examples of respectively a polar and a constituent d-linked clause with the main clause syntax.

(43)   a.   Alfred wonders should he also leave now.
      b.   Alfred wonders what should he do now.

The last distinction considered in this thesis is between *finite* and *non-finite* clauses. It is perpendicular to the declarative-interrogative distinction, and thus, it doubles the number of complements considered. For each type of clauses considered above we distinguish between finite and non finite clauses. All of the considered types of clauses are represented by Figure 1.1:

Apart from the clauses from the presented classification, the questionnaire considers also concealed questions like (44-a). It is crucial to notice that these questions should not be confused with D complements. The meaning of the concealed question has to be equivalent to an actual question like in (44). For example, (45) cannot be taken as evidence the verb "to believe" can embed concealed questions.

(44)   Alfred announced...

Clauses

Declarative　　　　　　　Interrogative

finite　non-finite　polar　alternative　constituent

finite　non-finite　finite non-finite　d-linked　non-d-linked

with main clause syntax

finite non-finite / finite non-finite

with main clause syntax
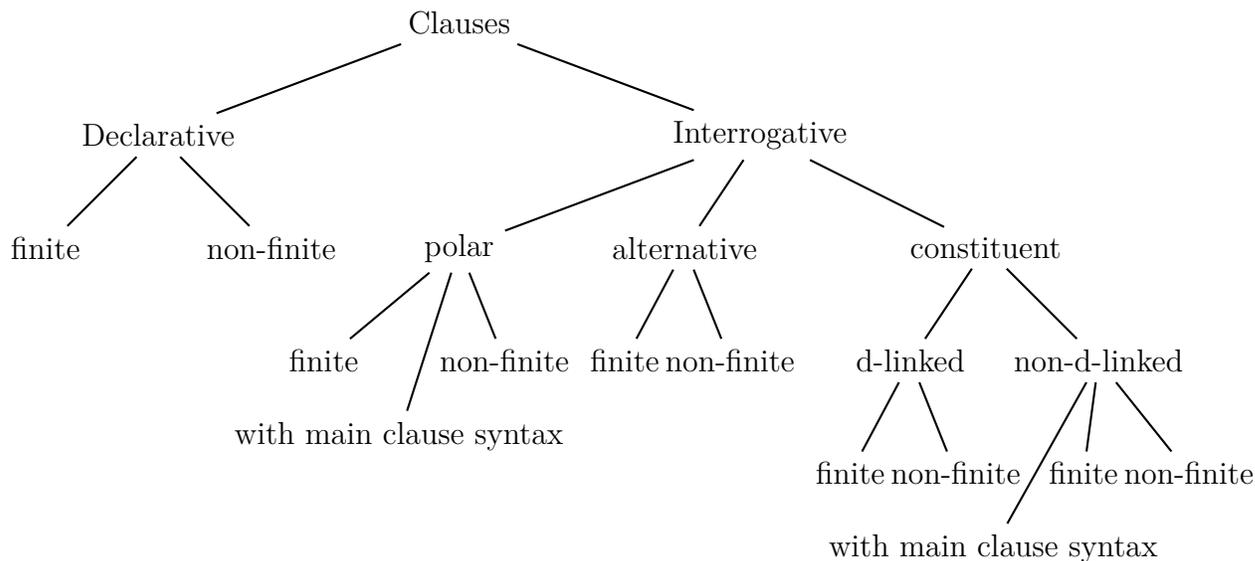
Figure 1.1: Types of complements considered.

    a.   the date of his party.

    b.   what will be the date of his party.

(45)   Alfred believes Mary.

1.4　Constraints characterising the selectional behaviour of the clause-embedding predicates

In this section, I will discuss some hypotheses that aim to explain the selectional behaviour of the clause-embedding predicates regarding the puzzle presented in Section 1.1 in Table 1.1. This section aims to present the state of the art research from the last years as a point of reference for the data I have gathered in this thesis project. In Chapter 3, I will discuss the relevance of the data from the Polish language in light of the hypotheses presented here.

Grimshaw (1979) claims that the selectional behaviour of clause-embedding predicates is entirely unpredictable. Therefore every predicate embeds certain types of

clauses, but there is no real reason for why it behaves as it behaves. Mayr (2019) gives two arguments against this view:

Firstly, the selectional behaviour tends to be stable across languages. As Mayr indicates in their examples, different translations of the same verb tend to embed the same types of clauses. Possible variations are usually due to a difference in meaning or grammatical properties (see, e.g. the Polish verb "mie nadziej" in Section 2.2). According to Mayr (2019), if the clause-embedding predicates' selectional behaviour were arbitrary, it would vary across different languages.

Moreover, Mayr (2019) observes that the selectional properties of some clause-embedding (e.g. be certain) properties change under negation. If the selectional behaviour is specified arbitrarily for every predicate, then it should not vary across contexts unless it depends on the predicate's meaning. Since, as the sentences in (46) show, selectional properties of some verbs vary across contexts, they are dependent on the meaning of the predicates. Moreover, similar variations were observed in the modal contexts by Roberts (2019) and under tense/aspect change by Özyıldız (2021) (see also the examples in Section 1.2).

(46)   a.   Alfred is certain that Bertrand will come to the party.
        b.   *Alfred is certain whether Bertrand will come to the party.
        c.   *Alfred is not certain that Bertrand will come to the party.
        d.   Alfred is not certain whether Bertrand will come to the party.

Therefore looking for general constraints or characteristics of clause embedding predicates is not a doomed task. The first hypothesis that was studied by, among others, Hintikka (1975), Ginzburg (1995) and Lahiri (2002) is as follows:[19]

Hypothesis 1. $\mathbb{V}_1$*: (Veridicality hypothesis 1) A predicate V is responsive iff it is veridical.*

This hypothesis was criticised by both Lahiri (2002) and Egré (2008), as there are responsive predicates that are not veridical. Consider for instance the predicates

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[19]Egré (2008) noticed that some authors talked about the *factivity hypothesis*. But, since factivity implies veridicality any counterexample to the veridicality hypothesis will also be a counterexample for the factivity hypothesis. Thus I only consider the former.

of speech such as "tell". Observe that (47-a) is a well-formed sentence of English and thus the verb "tell" is a responsive predicate. However, since (47-b) does not imply (47-c) then the verb "tell" is not veridical (consider the scenarios in which Alfred lies to Bertrand). Therefore the veridicality hypothesis can be rejected.

(47)   a.   Alfred told Bertrand who came to the party.
         b.   Alfred told Bertrand that Ludwig came to the party.
         c.   Ludwig came to the party.

In sight of this refutation, Egré (2008) proposed the following weakening of this hypothesis, corresponding to one (right to left) direction of the bi-implication in the original hypothesis:

Hypothesis 2. $\mathbb{V}_2$*: (Veridicality hypothesis 2) If a predicate V is veridical then it is responsive.*

Egré (2008) himself points out that emotive predicates like "regret" are potential counterexamples to his hypothesis, as they seem to be veridical and not embed questions. Mayr (2019) adds the verb "to resent" to this list. However, Egré (2008) argues that these emotive predicates should not be seen as a counterexample to his hypothesis, as they only imply that the complement is believed by the subject and not that it is true. However, the evidence suggest that they pass the veridicality test so that can be seen as proper counterexamples. Observe that (48-a) seems to imply (48-b) and that (48-c) is not a well formed sentence in English. Discussing whether or not these are good counterexamples to $\mathbb{V}_2$ lies outside of the scope of this thesis, as I am not a native speaker of the English language. I will only provide evidence that this behaviour is mirrored in Polish.

(48)   a.   Alfred resents that Bertrand came to his party.
         b.   Bertrand came to Alfred's party.
         c.   *Alfred resents who came to the party.

Somewhat inspired by the veridicality hypothesis, Spector and Egré (2015) put forward the following constraint to characterise the class of responsive predicates with

respect to their veridicality:

Hypothesis 3. $\mathbb{UV}$*: (Uniform behaviour w.r.t veridicality) A predicate is veridical and responsive iff it is Q-to-P veridical.*

Note that this hypothesis is not proposed to solve the main puzzle concerning the selectional properties of clause-embedding predicates presented in Table 1.1. It is supposed to give more insight into the class of responsive predicates and explain some of their behaviour. Moreover, Spector and Egré (2015) use it to justify the P-to-Q reduction solution to the responsiveness puzzle as described in Section 1.2. However, as discussed by Uegaki (2019), the predicates of relevance like "care", that are veridical but not Q-to-P veridical are clear counterexamples to this hypothesis. Predicates of relevance belong to the class of preferential predicates, which can be characterised by the following definition:

Definition 24. *(Preferential predicates) A predicate is preferential iff it has a preference, opposition or indifference implication.*

Uegaki and Sudo (2019) presents the following generalisation regarding the class of preferential predicates.

Hypothesis 4. $\mathbb{NVP}$*: If a predicate is non-veridical and preferential then it is also anti-rogative.*

I am not aware of any existing linguistic data that would contradict this hypothesis and thus it seems that indeed being non-veridical and preferential is a sufficient condition for a predicate to be anti-rogative. Another interesting sufficient condition of anti-rogativity and is still considered to hold was presented by Theiler et al. (2019) who followed the intuition of Zuber (1982):

Hypothesis 5. $\mathbb{NR}$*: If a predicate is neg-raising then it is also anti-rogative.*

Moreover, (Theiler et al., 2018) discuss the property of c-distributivity and propose the following following constraint to describe the class of responsive predicates:

Definition 25. *(C-distributivty) A predicate V is c-distributive iff it is P-to-Q distributive and Q-to-P distributive.*

Hypothesis 6. $\mathbb{CD}$ *All responsive predicates are c-distributive.*

Roelofsen and Uegaki (2021) observe that this condition is too strong as the predicates of relevance also violate Q-to-P distributivity. They explain that (49-a) can be true even if (49-b) and (49-c) are not.

(49)   a.   Alfred cares whether Bertrand left.
        b.   Alfred cares that Bertrand left.
        c.   Alfred cares that Bertrand did not leave.

However, Roelofsen and Uegaki (2021) also propose after Uegaki (2019) that the notion of c-distributivity can be weakened using Strawson entailment to accommodate for the predicates of relevance. Nevertheless, as Roelofsen and Uegaki (2021) argue, linguistic data from Estonian (*mõtlema*) provided by Roberts (2018) and Japanese (*daroo*) discussed by Uegaki and Roelofsen (2018), are evidence against this generalisation. Therefore they propose the following hypothseis:

Hypothesis 7. $\mathbb{QP}$ *All responsive predicates are P-to-Q distributive.*[20]

One of the MECORE project's goals is to investigate whether these hypotheses can be confirmed or refuted by the linguistic data from many different languages. The next chapter discusses the data collection process and contains some methodological remarks. Chapter 3 will discuss all the hypotheses from this section regarding the evidence collected in the database.

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[20]Note that Roelofsen and Uegaki (2021) call this property P-to-Q entailment.

Chapter 2

Database of the Polish clause-embedding predicates

This chapter discusses the database of the semantic and selectional properties of the clause-embedding predicates in Polish that I created using the methodology of the MECORE project by Uegaki et al. (2022). My study analyses 48 Polish clause-embedding predicates with respect to all the semantic and selectional properties presented in Section 1.3. The spreadsheet containing the results can be found in Appendix A and the linguistic evidence for each entry in the spreadsheet in Appendix B. Firstly, I discuss the methodology of the data collection process and some practical and methodological challenges that have to be overcome by the consultants. Then I discuss some properties of the Polish language and the issues with English to Polish translation. The results of the study and their application to the current literature on clause-embedding predicates are presented in Chapter 3.

2.1 Creation of the database

The MECORE questionnaire by Uegaki et al. (2022) is designed to collect data from any language which uses the clause-embedding predicates. It provides a list of the English predicates that ought to be analysed and several tests (also in English)

that have to be performed on each predicate to discover its semantic and selectional properties. The questionnaire also provides a spreadsheet template that has to be filled in with the final data. Therefore there are three stages of the data collection:

1. Translation

2. Application of the tests

3. Testing and adjusting the tests and predicates

This chapter will follow these three steps and discuss each of them in depth. In Section 2.2 I discuss in detail some issues with English to Polish translation, and in Section 2.3 I provide the full list of the selectional properties considered. Before discussing these issues, I would like to showcase the process of data collection. For *veridicality* the marking instructions are as follows (Uegaki et al., 2022):

Veridicality test:
Consider:

(1)   Ann P's that it is raining.

Does this sentence always imply that it is raining? If not, does this sentence always imply that it is not raining?

Marking instructions:
- If you answered yes to the first question, please mark P' as **always veridical**.
- If you answered yes to the second question, please mark P' as **always anti-veridical**.
- If you answered no to both questions, but you feel that the sentence typically implies that it is raining, please mark P' as **typically veridical**.
- Similarly, if you answered no to both questions, but you feel that the sentence typically implies that it is not raining, please mark P' as **typically anti-veridical**.

- Otherwise, please mark P' as **neither**.

Observe that the main test sentence corresponds precisely to the antecedent of the implication in the definition of veridicality and anti-veridicality presented in Section 1.3.1 and the sentences whose truth-value has to be judged to the respective consequents. The reader can reproduce other marking instructions for most properties using the other definitions. To allow for some uncertainty in the judgment questionnaire allows for judging some predicates as "typically veridical" or "typically anti-veridical". Some discussion in the text document should support such judgment to motivate such an answer. This discussion should allow the main researchers to determine whether the verb is veridical or anti-veridical and help other consultants of the same language understand the problematic situation considered by the original consultant.

The first step of the consultant's work is to translate the relevant test sentence. I always provide the word by word translation of the Polish test sentence, as well as the original test in the following form:

(1a) Anna P', e   pada.
      Ann P' that it is raining
      "Ann P' that it is raining"

After translating all of the tests to the target language, the consultants can start plugging in the predicates for "P". In many cases, the tests require some adjustments to make sense. For example, (1) does not make much sense, and it can be exchanged for (2). Sometimes, to avoid habitual readings the sentences are used in the simple past tense like (3). The changes are allowed as long as the general structure and meaning of the test sentence does not change.

(1) Ann decyduje, e   pada.
     Ann decides   that it is raining
     "Ann decides that it is raining"

(2) Anna decyduje, e   Piotr bdzie uczy skadni.
     Ann   decides, that Peter will   teach syntax.
     "Ann decides, that Peter will teach syntax."

(3) Anna zdecydowaa, e   Piotr bdzie uczy skadni.
     Ann   decided,   that Peter will   teach syntax.
     "Ann decided, that Peter will teach syntax."

The process of analysing the selectional properties is very similar. A test sentence
has to be translated to the target language, and the consultants are asked to judge
its grammaticality.

The last stage of creating the database is performing the tests and filling in the
spreadsheet with the results. In many cases, the tests are trivial because either the
test sentences are completely ungrammatical or the inferences are clearly (in)valid,
but in other cases, the judgment is not so clear.[1] During this phase of the project, I
have consulted and The National Corpus of Polish by Pzik (2012), as well as many
native speakers of Polish to confirm my judgements. The results of this process can
be found in the Appendices A and B.

2.2   Some remarks on the English to Polish translation

Even though Polish and English are similar to some extent, as they are both Indo-
European languages, they belong to different language groups – Germanic and Slavic,
respectively (Fortson, 2011). Therefore the translation of each verb does not ensure
the preservation of the meaning. In some cases, two readings of an English predicate
become two different predicates in Polish (e.g. *accept* or *complain*); in other cases,
Polish verbs have two readings which require disambiguation to mirror the meaning
of the corresponding English predicate (e.g. *obchodzi*, *zapewni*). It is important to
find an accurate translation for as many verbs as possible since the list has been
created to ensure enough variety in the types of relations they express (e.g. doxastic,
of speech, preferential etc.).

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[1]Judging the inferences that are provided by the questionnaire, I frequently claim that they are
valid or *invalid*. These notions do not refer to logical validity but rather to *conversational validity*.

Polish language, as opposed to English, has an extensive aspectual morphology. Meanwhile, English distinguishes between stative and change-of-state interpretations of verbs using tenses; Polish uses aspect (Młynarczyk, 2004). In many cases, the stative interpretation is achieved using verbs with imperfective aspects and the change-of-state interpretation using verbs with perfective aspects. In Polish, verbs often form aspect pairs, i.e. they differ only in their aspect and otherwise have the same meaning (e.g. *pisa/napisa* [eng: *to read*], *mówi/powiedzie* [eng: *to tell*]). Observe that it is not the case that every verb in an aspect pair is syntactically related to the other, and therefore these are really pairs of verbs rather than one verb, which changes aspect. Typically, I analyse verbs in the imperfective aspect in the present tense to ensure the stative interpretation. However, in many cases, as in English, the stative interpretation does not make much sense, and therefore I use verbs in the imperfective aspect. Since the semantic and selectional properties of verbs may vary within an aspect pair, I always make sure that it is clear that I made such a change (Zuchewicz, 2020).

Translation of the tests is usually straightforward and does not cause many issues. However, filling them in with the predicates and adjusting the sentences becomes a bit more problematic. It is difficult to define what precisely can be changed if the test sentences are given in plain English. Therefore I would argue that providing some formal representation of the tests would make the method more sound. It would allow for all the changes that do not influence the meaning of test sentences' crucial semantic components, leaving out the unimportant details for the consultant. I presented such a method in Section 1.3. Some more difficulties are discussed below:

Auxiliary verbs may cause some variations under translation that are not due to their semantically but rather syntactic properties. For example, as indicated by White (2021) the English verb *to hope* is able to embed interrogatives in continuous tenses like in (4) because it acquires the activity interpretation. Since the Polish translation of this predicate uses the auxiliary verb "mie" [eng: *to have*], which does not have the activity interpretation, this reading is unavailable as in (5).

(4)   I was hoping whether you could help me.

(5) *Miaem nadziej czy   mógby   mi pomóc.
     I had   hope   whether you could me help.
     "*I hoped whether you could help me."

The particle "to" is problematic for the question of the semantic and selectional properties of the verbs in Polish. It can be used as shown in (6) and (7). For most verbs, it is syntactically optional and semantically transparent, i.e. adding this particle or not does change anything in the meaning of the sentence or the selectional properties of a predicate. However, some native speakers reported that, in some specific contexts, it is syntactically needed to form a grammatically correct sentence. However, at least among the people I consulted, there is no agreement about in which contexts it is needed. Some people report that some sentence needs the "to" particle, and others judge the same sentence completely fine without it. Moreover, some verbs allow embedding some clauses in some contexts only using the "to" particle (e.g. "akceptowa" [eng: *to accept*] can embed clauses only using "to"). Since it would double the number of data points, I do not distinguish between embedding using "to" and without it in the database, but whenever the use of "to" seems to influence the properties, I mention that. There is a possibility for original research into this phenomenon, which lies outside the scope of this thesis.

(6) Anna P' to, e   pada.
     Ann P it, that it is raining.
     "Ann P that it is raining."

(7) Anna P', e pada.
     Ann P it, that   it is raining.
     "Ann P that it is raining."

The lack of strong NPIs in Polish makes it more difficult to judge whether a predicate is neg-raising. As I mentioned above, since the neg-raising inference is cancellable, it is not always obvious how to judge a particular predicate. To address this problem, the questionnaire authors provide a second test for neg-raising. It asks to judge whether the sentence (8), which contains a strong NPI is grammatical when we substitute the verb in question for P. Polish does not have such an NPI as an NPI

always require the use of the second negation "nie" in the clause, as indicated in the translation (9) of the test sentence.

(8)   Ann doesnt *P'* that Bill has called his father **in years**.

(9)   Anna nie   *P*, e   Bill nie   dzwoni do swojego ojca   **przez lata**.
       Ann   NEG *P'*, that Bill NEG call   to his   father in years.
       "Ann doesnt *P'* that Bill has called his father in years"

The subjunctive mood complements are frequently used in the Polish language. Many clause-embedding predicates do not embed clauses in the indicative mood, but they embed clauses in the subjunctive mood only (e.g. the verb *chcie* [*eng: to want*] as indicated in (10) and (11)). I distinguish between these two types of clauses while judging the selectional properties of the predicates. However, since the meaning of the subjunctive mood complements does not significantly differ from the meaning of the indicative complements, I do not make this distinction for the semantic properties. This choice is independently motivated by the formal representation of the properties that I provide in Section 1.3.1.[2]

(10)   *Anna chce,   e   pada.
        Ann   wants, that it is raining.
        "Ann wants that it is raining."

(11)   Anna chce,   eby   padao.
        Ann   wants, that would it was raining.
        "Ann wants that it is raining."

2.3   Complement types in Polish

In this section, I present the types of complements in Polish that are considered in the database. Then, I discuss several issues that arise while considering some of them.

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[2]I discuss this issue here instead of doing that in Section 2.3, as it concerns both semantic and selectional properties.

Polish does not differ from English too much in terms of types of complements. There is only one type that does not exist in Polish (Finite polar interrogative clause with main clause syntax) and one type that is considered additionally (declarative clauses in the subjunctive mood). I represent the English predicate as P and its polish translation as P'. In the database I consider the following types of complements:

Finite declarative clauses in indicative mood

(12) Anna P', e Maks czyta Wojn i Pokój.
  Ann P that Max read War and Peace.
  "Ann P that Max read War and Peace."

Finite declarative clauses in subjunctive mood

(13) Anna P', eby Maks czyta Wojn i Pokój.
  Ann P that would Max read War and Peace.
  "Ann P that Max read War and Peace."

Finite d-linked constituent interrogative clauses

(14) Anna P', któr ksik czyta Maks.
  Ann P which book Max read.
  "Ann P which book Max read."

Finite non-d-linked constituent interrogative clauses

(15) Anna P', co Maks czyta.
  Ann P what Max read.
  "Ann P what Max read."

Finite polar interrogative clauses

(16) Anna P', czy Maks czyta Wojn i Pokój.
  Ann P whether Max read War and Peace.
  "Ann P whether Max read War and Peace."

Finite alternative interrogative clauses

(17) Anna *P′*, czy   Maks czyta Wojn i   Pokój czy Ann   Karenin.
      Ann   *P* whether Max   read War and Peace or   Anna Karenina.
      "Ann *P* whether Max read War and Peace or Anna Karenina."

Finite non-d-linked constituent interrogative clauses with main clause syntax

(18) Maks *P′*, co   powinien teraz zrobi.
      Max   *P* what should he now   do.
      "Max *P* what should he do now."

Non-finite declarative clause without subject

(19) Anna *P′* przeczyta Wojn i   Pokój.
      Ann   *P* to read   War and Peace.
      "Ann *P* to read War and Peace."

Non-finite d-linked constituent interrogative clause without subject

(20) Anna *P′*, któr   ksik   przeczyta.
      Ann   *P* which book to read.
      "Ann *P* which book to read."

Non-finite non-d-linked constituent interrogative clauses without subject

(21) Anna *P′*, co   przeczyta.
      Ann   *P* what to read.
      "Ann *P* what to read."

Non-finite polar interrogative clauses without subject

(22) Anna *P′*, czy   przeczyta Wojn i   Pokój.
      Ann   *P* whether to read   War   and Peace.
      "Ann *P* whether to read War and Peace."

Non-finite alternative interrogative clauses without subject

(23)　Anna *P'*, czy　　przeczyta Wojn i　Pokój czy Ann　Karenin
　　　 Ann　*P*　whether to read　War　and Peace or　Anna Karenina.
　　　 "Ann *P* whether to read War and Peace or Anna Karenina."

Concealed questions

(24)　Anna *P'*, cen　　　mleka.
　　　 Ann　*P*　the price of milk.
　　　 "Ann *P* the price of milk."

Below I discuss several issues that arise for some types of complements:

Finite polar interrogative clauses with main clause syntax do not exist in Polish. An example of such a clause, provided by the questionnaire is (25) and the only possible translation to Polish of this sentence is (26) which is a finite polar interrogative clause but it does not have the main clause syntax. Therefore I do not consider this type of complements in the database. However, I still consider Finite non-d-linked constituent interrogative clause with main clause syntax, as they exist in Polish. Consider the sentence as an example.

(25)　Max *P*s should he read this book now?

(26)　Max *P'* **czy**　　powinien　przeczyta teraz t　　ksik.
　　　 Max *P* **whether** he should read　　now　this book.
　　　 "Max *P*s should he read this book now?"

(27)　Max *P'* co　powinien　teraz zrobi.
　　　 Max *P*　what should he now　do.
　　　 "Max *P*s what should he do now?"

Alternative questions in Polish have a default reading of an exclusive disjunction. In Polish, there are two main words to express a disjunction which are "lub" and "albo" as in (28). First of them generally corresponds to the inclusive disjunction and the second usually to the exclusive one. However, instead of these two, the word "czy" is used in the interrogative clauses as a translation of "or". The word "czy"

translates to "whether" and is used to formulate polar and alternative questions like (29). It has a default reading of an exclusive disjunction as it introduces "polarity" to the sentence. Observe that in the example (30) the same word ("czy") is used twice: at the beginning of the clause and between the alternatives.

(28)   Alfred wypi kaw   lub/albo herbat.
        Alfred drank coffee or   tea.
        "Alfred drank coffee or tea."

(29)   Chcesz   kaw czy   herbat?
        You want coffee whether tea?
        "Do you want coffee or tea?"

(30)   Anna P' **czy**   Max czyta Wojn i   Pokój **czy**   Ann Karenin.
        Ann *P*s whether Max read War and Peace whether Anna Karenina.
        "Ann *P*s whether Max read War and Peace or Anna Karenina."

Concealed questions are a bit more problematic, as Polish grammar distinguishes between the cases of nouns. Therefore a concealed question, which syntactically is a *DP* complement, has to occur in the right case that is to be accepted by the predicate. Normally the concealed questions occur in the Accusative case like in (31). However, the meaning of some of the cases (e.g. Genitive or Instrumental) in Polish is achieved in English using prepositions like in (32). Therefore, it is unclear for predicates like *by niewiadomym* in (32), that accept only these cases whether we can say that they embed concealed questions. I decided to answer positively to this question and say that a predicate accepts concealed questions, as long as the test sentence is grammatical and can be paraphrased using a "proper" question l like in (32). In the database, I always indicate what the case of the accepted concealed question is.

(31)   Anna napisaa cen mleka.
        Ann wrote   the price of milk$_{ACC}$
        "Ann wrote the price of milk."

(32)   Anna jest niewiadoma ceny mleka.
        Ann is   unaware   the price of milk$_{GEN}$

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"Ann is unaware of (what is) the price of milk."

2.4 Some remarks on the methodology and the use of the database

The database can be used for a cross-linguistic confirmation or refutation of the existing hypotheses presented in Section 1.4, that explain the selectional behaviour of the classes the clause-embedding predicates. I discuss the results of this application to these hypotheses in Chapter 3. Moreover, the database can help look for new generalisations or refine existing ones. In this section, I discuss the practicalities of using the database and some shortcomings of this approach.

As presented in Section 1.4, the hypotheses presented in the literature are of the following logical forms:

1. Implication

2. Bi-implication

3. Universal statement

The construction of the database allows us to easily check the validity of a hypothesis of any sentence that has one of the listed logical forms. To check the validity of a sentence in the form of an implication, we isolate all the verbs that have the property from the antecedent and check whether they also have the property from the consequent. To check the validity of a sentence in the form of a bi-implication, we do this twice, once for each implication. To check the validity of a universal statement, we check whether all the verbs satisfy the relevant property. These procedures will automatically result in finding the relevant counterexamples if they exist.

This method can be very fruitful and provide interesting results, which I discuss in Chapter 3. However, before proceeding to this part, I need to address several shortcomings and issues of this method.

The size of the database makes it infeasible to run a study that involves enough native speakers of a language to ensure full-proof results. It makes the study results questionable as it depends on an introspective judgment of just one person. Even though I created the database very carefully, mistakes are statistically unavoidable since it contains around 1500 data points. Moreover, the judgments may differ between native speakers, and this method will not detect any variation. To accommodate this issue, the primary investigators organised regular meetings where consultants working on data from different languages could compare their results. Obviously, cross-linguistic variations exist, but since the predicates have the same meaning, they should not be widespread. Therefore, looking at some language can provide insight into another, which helps avoid some mistakes.

The confirmation of the existing hypotheses is questionable. Since the database analysis only some predicates and since one consultant creates it, we will not get an ultimate confirmation of a hypothesis even for one language. Moreover, the actual degree of confirmation is very low due to the same issues. However, the study can confirm that the existing counterexamples against the hypotheses behave uniformly across languages, making them stronger. However, the study may be instrumental for falsifying a hypothesis, as it allows finding a piece of evidence that contradicts the hypothesis. Since Karl Popper (2005), we know that one piece of falsifying evidence "weights" more than a number of them that support a hypothesis. Moreover, running a short study to confirm or reject the falsifying piece of evidence can be quickly performed as it requires an analysis of only one predicate and only the relevant properties. I perform such a study in Chapter 4.

The generality of the claims in the questionnaire is questionable. As indicated in Section 1.3.1, a semantic property ranges over all the subjects and all the complements. In the questionnaire, one specific example is evaluated. The consultants can tweak it a bit, but the particular context may lead to false conclusions for some verbs. (See Chapter 4 for more details) Therefore a strong (but fairly standard) assumption is required, namely that the predicates behave uniformly concerning all the sufficiently similar subjects and complements. The researchers tried to define the context in such a way to avoid it, but this may be insufficient to ensure the complete generality of the results for each predicate.

The scope of the study is limited concerning both semantic and selectional properties. The choice of semantic properties is inspired by the previous research. Therefore discovering a new hypothesis in the process is unlikely, as the combinations of the properties have already been checked for English and other languages. Considering the most influential papers like those of Spector and Egré (2015) as well as of Theiler et al. (2019) or Roelofsen and Uegaki (2021), looking at properties that weren't previously considered was the most fruitful. The study only analyzes the selectional properties of the verbs in simple contexts like $\ulcorner sVc \urcorner$ where c is a complement of some type. As indicated in Section 1.2 many verbs change their selectional properties in more complex contexts (under negation, modalities or tense/aspect change). These contexts can be crucial in solving the responsiveness puzzle and are very important from the perspective of the research.

It should be clear by now that all the issues are interdependent. Because the size of the database is so huge, it is infeasible to perform a study that would provide a higher degree of confirmation. Broadening the scope of the study would lead to an even bigger size of the database, which would undermine the results further. Therefore the only reasonable approach is to keep all these three factors balanced, and such a balance seems to be achieved by the current method. Moreover, considering some additional predicates, properties, or even contexts can be done without trouble, but it is impossible to include everything.

Is it, therefore, worth the effort to perform such a study? I would argue that it is. First of all, as mentioned above, the database is a good falsification tool. It allows detecting potential counterexamples and running a detailed study of these predicates to confirm their properties. Moreover, the consultants who (like me) would like to research clause-embedding predicates have to focus their attention on many predicates, which may lead to some discoveries. Furthermore, the text document, which describes the properties of the clause-embedding predicates, can be used by other researchers to inspire their studies. I don't think anyone would like to read 400 pages of linguistic data from a language they do not know; however, the spreadsheet allows one to look for the most interesting parts.

Thus the database should not be treated as an oracle that gives the researchers

written in stone facts about a language. It should be a starting point for further independent research as it can indicate interesting analysis points. Therefore the size of the database can be seen as its feature because it allows looking at many predicates to determine which are worth to be investigated closely. In fact, in Section 3.2 I discuss several predicates that are worth further investigation.

Chapter 3

Results

In this chapter, I discuss the relevance of the database for the state of the art research in clause embedding predicates. Firstly, I extract the relevant data from the database for each hypothesis presented in Section 1.4, which either confirms it or provides a counterexample. Then I discuss these results and indicate whether they are consistent with the current state of the research. In the second part of this chapter, I discuss some predicates that are interesting in light of the presented hypotheses and provide more linguistic insight into their properties. This part of the chapter indicates further research possibilities discovered by studying the database. In Chapter 4, I provide an experimental study of one of these predicates.

3.1 Verifying the existing constraints against the database

In this section, I will discuss the database in light of the hypotheses that I presented in Section 1.4. I will use the database to either confirm them or provide counterexamples.[1]

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[1] To extract the smaller tables from the database I used a simple python program.

3.1.1 The veridicality hypotheses: $\mathbb{V}_1$, $\mathbb{V}_2$ and $\mathbb{UV}$

Firstly, let's recall the veridicality hypothesis $\mathbb{V}_1$: *A predicate V is responsive iff it is veridical.* As indicated by Table 3.1, its right to left direction is violated by the predicates of speech (e.g. "mówi", "pisa" *eng:* "tell", "write"), some "negative" preferential predicates ("ba si" i "martwi si" *eng:* "fear", "be worried"), and predicates expressing of agent's epistemic attitudes which imply lack of knowledge or certainty ("spodziewa si" and "podejrzewa" *eng:* "expect", "suspect"). It is interesting to notice that the behaviour of the last pair is not surprising given that, as shown by Mayr (2019), the English predicate "to be certain" can embed questions only under negation (see (1) and (2)). Its Polish translation "by pewnym" behaves analogically. However, it remains unclear why these two verbs cannot embed polar complements, but "by pewnym", similarly to "to be certain" can (see (3) and (4)).

(1)   *Anna jest pewna, która zawodniczka wygraa wycig.
        Ann is   certain, which player   won   the race.
        "*Ann is certain, which player won the race."

(2)   Anna nie   jest pewna, która zawodniczka wygraa wycig.
        Ann NEG is   certain, which player   won   the race.
        "Ann is not certain, which player won the race."

(3)   *Anna spodziewa si   /podejrzewa, czy   Maria wygraa wycig.
        Ann expects   oneself /suspects,   whether Mary won   the race.
        "Ann expects/suspects, whether Mary won the race."

(4)   Anna nie   jest pewna, czy   Maria wygraa wycig.
        Ann NEG is   certain, whether Mary won   the race.
        "Ann is not certain, whether Mary won the race."

The other direction of $\mathbb{V}_1$ is exactly the $\mathbb{V}_2$ hypothesis. As indicated in Table 3.2 the only counterexample to this hypothesis that can be found in the database is the verb "aowa" (*eng:* "to regret"). This result is unsurprising, as the same verb is mentioned as a counterexample in Section 1.4. However, in the defence of this hypothesis, Egré (2008) claims that this verb is not veridical, but only belief entailing.

Predicate	Translation	Veridicality	Responsiveness
myli si	be wrong	anti-veridical	responsive
martwi si	be worried	neither	responsive
ba si	fear	neither	responsive
oznajmia	announce	neither	responsive
spiera si	argue	neither	responsive
narzeka	complain	neither	responsive
wyjania	explain	neither	responsive
informowa	inform	neither	responsive
powiedzie	tell	neither	responsive
wyszepta	whisper	neither	responsive
napisa	write	neither	responsive
spodziewa si	expect	neither	responsive
podejrzewa	suspect	neither	responsive
dowiedzie si	learn	neither	responsive

Table 3.1: Data contradicting the right to left direction of the $\mathbb{V}_1$ hypothesis

I address this defence in Section 3.2.4 to conclude that we should accept "aowa" as veridical and thus as a counterexample to $\mathbb{V}_2$, but a more detailed (empirical) study should be performed to confirm my judgement. Since the only (potential) counterexample did not receive a proper analysis in the literature, it is difficult to conclude whether the $\mathbb{V}_2$ hypothesis is true.

Predicate	Translation	Veridicality	Responsiveness
aowa	**regret**	**veridical**	**anti-rogative**
zdecydowa	decide	typically veridical	responsive
akceptowa	accept	veridical	responsive
by niewiadomym	be unaware	veridical	responsive
wiedzie	know	veridical	responsive
mie racj	be right	veridical	responsive
zapomnina	forget	veridical	responsive
by zadowolonym	be happy	veridical	responsive
by zaskoczonym	be surprised	veridical	responsive
obchodzi	care	veridical	responsive
widzie	see	veridical	responsive

Table 3.2: Data relevant for the $\mathbb{V}_2$ hypothesis

Hypothesis $\mathbb{UV}$, which claims that responsive predicates behave uniformly with respect to veridicality and Q-to-P veridicality, is falsified in Polish by three verbs from the database: "dba", "wyjani", and "dowiedzie si" (*eng:* "care", "explain" and "learn" respectively.), as shown in (4).

The English verb "to care" is a known counterexample to one direction of this hypothesis (see above). There are three other verbs in Polish that seem to be counterexamples to the other direction of this hypothesis. The verbs "wyjani" and "dowiedzie si" are not veridical but they, at least at first, seem Q-to-P veridical I discuss both of them, in more detail, in Section 3.2. Regarding the verb "spodziewa si" (*eng:* "expect"), it is unclear whether it is Q-to-P veridical or not. In Chapter 4, I discuss this verb in depth and present an empirical study of its properties.

Predicate	*Translation*	*Veridicality*	*Q-to-P veridicality*
obchodzi	care	veridical	not Q-to-P veridical
wyjania	explain	neither	Q-to-P veridical*
dowiedzie si	learn	neither	Q-to-P veridical
spodziewa si	expect	neither	Q-to-P veridical*

Table 3.3: Data relevant for $\mathbb{UV}$ hypothesis.

3.1.2 The $\mathbb{NR}$ hypothesis

The $\mathbb{NR}$ hypothesis claims that any neg-raising predicate is anti-rogative. This hypothesis was confirmed by the database. Table 3.4 illustrates that the hypothesis explains the behaviour of only three predicates. In the table, the verb "spodziewa si" (*eng:* "to expect") is listed as neg-raising, but only because the test provided in the questionnaire allows to make this conclusion. Chapter 4, shows that this verb is non neg-raising and thus that its responsiveness does not violate the $\mathbb{NR}$ hypothesis. It is worth mentioning that even though neg-raising verbs constitute a very small sub-group of the anti-rogative predicates, it is essential as it explains the behaviour of the verb "believe", which was given a lot of attention in the literature (Theiler et al., 2018, 2019).[2]

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[2]Note that the MECORE questionnaire investigates the selectional properties of the predicates only in a "neutral" context (without negations or modalities). Therefore examples discussed in

Predicate	*Translation*	*Neg-raising*	*Responsiveness*
chcie	want	Neg-raising	anti-rogative
wierzy	believe	Neg-raising	anti-rogative
myle	think	Neg-raising	anti-rogative
spodziewa si	expect	non Neg-raising*	responsive

Table 3.4: Data relevant for $\mathbb{NR}$ hypothesis

3.1.3 Analysis and refinement of the $\mathbb{NVP}$ hypothesis

The $\mathbb{NVP}$ hypothesis claims that any predicate that is not-veridical and preferential is also anti-rogative. As indicated in Table 3.5 There are three predicates in Polish that are counterexamples to this hypothesis: "martwi si", "ba si" i "narzeka" (*eng*: "be worried", "fear" and "complain" respectively).

However, Uegaki and Sudo (2019) use Romero (2015)'s degree-based semantics to describe the meaning of preferential predicates which, for any class of comparison, provides a threshold of preference. To license the utterance of a preferential predicate the degree of preference has to be above this threshold. To derive anti-rogativity of the non-veridical preferentials Uegaki and Sudo (2019) proposed that an utterance of (a non-veridical) preferential predicate presupposes the *Threshold Significance*, i.e. that "[there is] an element in the comparison class whose degree along the relevant scale [of preference] is higher than the threshold."(Uegaki and Sudo, 2019, p.335)

As I argue in Section 3.2.3, all these predicates violate the presupposition of *Threshold Significance*. Since Uegaki and Sudo (2019) derive anti-rogativity from this presupposition and "martwi si" and "ba si" do not undermine the formal derivation of the paper, but they show that it is too narrow to justify the linguistic constraint expressed by the $\mathbb{NVP}$ hypothesis. Similarly, the *Threshold Significance* presupposition is violated by the predicate "narzeka" (*eng:* "to complain"). Moreover, this predicates seems to be preferential in a different way then other predicates, which may defend the $\mathbb{NVP}$ hypothesis. Moreover, embeds questions only with the preposition "na to" which translates as "about it" used as in (5) and is Q-to-P veridical. This can also be seen as a ground to defend the $\mathbb{NVP}$ hypothesis.

Section 1.2, in which these predicates embed interrogatives do not undermine the judgment that discussed predicates are not anti-rogative.

(5) Piotr narzeka   na to, która zawodniczka wygraa wycig
     Peter complains on it, which player   won   the race.
     "Peter complains about which player won the race. "

To accommodate for these issues with the $\mathbb{NVP}$ hypothesis, that are caused by predicates "martwi si", "ba si" and "narzeka" , a different conclusion should be drawn from the paper by Uegaki and Sudo (2019). Observe that the *Threshold Significance* presupposition coincides with the property of *having a preference implication*, as this property claim that, in the declarative case, an agent prefers the complement over other options. Therefore I argue that the condition of being "*positive*" should be added to the $\mathbb{NVP}$ hypothesis, as it would not be violated by my counterexamples and ensure that the predicates that satisfy the antecedent of the hypothesis also satisfy the *Threshold Significance* presupposition. Let's define the set of *positively preferential predicates* as follows:

Definition 26. *(Positively preferential predicates) A predicate is preferential iff it has a preference implication.*

Observe that Definition 26 is stronger then the definition of preferential predicates as it does not include predicates that have opposition or indifference implications. Thus I propose the hypothesis $\mathbb{NVPP}$ as a refinement of the hypothesis $\mathbb{NVP}$.[3] $\mathbb{NVPP}$ is formally justified by the derivation in the paper by Uegaki and Sudo (2019) and independently confirmed by the data collected in my database:

Hypothesis 8. $\mathbb{NVPP}$*: If a predicate is non-veridical and positively preferential then it is also anti-rogative.*

3.1.4   Hypotheses concerning distributivity: $\mathbb{CD}$ and $\mathbb{QP}$

The $\mathbb{CD}$ hypothesis claims that all the responsive clause-embedding predicates are P-to-Q and Q-to-P distributive. The $\mathbb{QP}$ hypothesis claims that only the first condition is satisfied. As indicated in Table 3.6, four verbs are problematic for these statements.

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[3]This hypothesis was also independently suggested in the GLOW presentation by Özyıldız et al. (2022) as a potential solution to the issue with negative preferential predicates.

Predicate	Translation	Veridicality	Preferentiality	Responsiveness
martwi si	**be worried**	**neither**	**preferential**	**responsive**
ba si	**fear**	**neither**	**preferential**	**responsive**
narzeka	**complain**	**neither**	**?preferential**	**responsive**
mie nadziej	hope	neither	preferential	anti-rogative
modli si	pray	neither	preferential	anti-rogative
wole	prefer	neither	preferential	anti-rogative
chcie	want	neither	preferential	anti-rogative
skary si	complain	neither	preferential	anti-rogative
by zadowolonym	be happy	veridical	preferential	responsive
by zaskoczonym	be surprised	veridical	preferential	responsive
aowa	regret	veridical	preferential	anti-rogative

Table 3.5: Data relevant for the $\mathbb{NVP}$ hypothesis

Verbs "obchodzi", "ba si" and "martwi si" (eng: "care", "fear" and "be worried") are not Q-to-P distributive, as in the declarative case, they presuppose that the complement is true, but in the interrogative case, there is no presupposition about any declarative complement being true (See Section 3.2.3). On the other hand, "spodziewa si" and "dowiedzie si" and "wyjani" (eng: "expect", "learn" and "explain") are not P-to-Q distributive, as they are not veridical but they are Q-to-P veridical (See Section 3.2).[4] Observe that the verb learn seem to have the same properties in English (see the Section 3.2 for a more detailed analysis.).

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[4]Observe that indeed satisfaction of these two properties imply that a predicate is not P-to-Q distributive. If a predicate V is non-veridical then there is at least one context C and declarative complement d such that $\ulcorner sVd \urcorner$ and $\ulcorner \neg d \urcorner$ are both true. Suppose for contradiction that V is P-to-Q distributive. Then for a question q such that $\neg d$ is a complete answer to q: $\ulcorner sVq \urcorner$. Since V is Q-to-P veridical and since $\ulcorner \neg d \urcorner$ is true then also $\ulcorner sV\neg d \urcorner$. Thus from $\ulcorner sVd \urcorner$ we can conclude "for free" that $\ulcorner sV\neg d \urcorner$, which cannot describe C consistently. However, a proper logical formalism should be developed to turn this reasoning into a proper logical proof.

Predicate	Translation	Q-to-P distributivity	P-to-Q distributivity
akceptowa	accept	Q-to-P distributive	P-to-Q distributive
martwi si	**be worried**	**not Q-to-P distributive**	**P-to-Q distributive***
ba si	**fear**	**not Q-to-P distributive**	**P-to-Q distributive**
oznajmia	announce	Q-to-P distributive	P-to-Q distributive
spiera si	argue	Q-to-P distributive	P-to-Q distributive
narzeka *	complain	Q-to-P distributive*	P-to-Q distributive*
wyjania	**explain**	**Q-to-P distributive**	**not P-to-Q distributive***
informowa	inform	Q-to-P distributive	P-to-Q distributive
powiedzie	tell	Q-to-P distributive	P-to-Q distributive
wyszepta	whisper	Q-to-P distributive	P-to-Q distributive
napisa	write	Q-to-P distributive	P-to-Q distributive
zdecydowa	decide	Q-to-P distributive	P-to-Q distributive
by niewiadomym	be unaware	Q-to-P distributive	P-to-Q distributive
spodziewa si	**expect**	**Q-to-P distributive**	**not P-to-Q distributive***
wiedzie	know	Q-to-P distributive	P-to-Q distributive
podejrzewa	suspect	Q-to-P distributive	P-to-Q distributive
mie racj	be right	Q-to-P distributive	P-to-Q distributive
myli si	be wrong	Q-to-P distributive	P-to-Q distributive
zapomnina	forget	Q-to-P distributive	P-to-Q distributive
dowiedzie si	**learn**	**Q-to-P distributive**	**not P-to-Q distributive**
by zadowolonym	be happy	Q-to-P distributive	P-to-Q distributive
by zaskoczonym	be surprised	Q-to-P distributive	P-to-Q distributive
widzie	see	Q-to-P distributive	P-to-Q distributive
obchodzi	**care**	**not Q-to-P distributive**	**P-to-Q distributive**

Table 3.6: Data relevant for $\mathbb{CD}$ and $\mathbb{QP}$ hypothesis

3.1.5 New proposal: The entailment hypothesis

Notice that in Table 3.6 there is no predicate that would be neither Q-to-P nor P-to-Q distributive, i.e. interrogative and declarative complements are are always *related by entailment.* As Spector and Egré (2015) observe that the existence of predicates, that would have a completely different meaning when they embed declaratives and interrogatives are implausible (e.g. their "*shknow*", which they define as "know" if it embeds a declarative and as "wonder" if an interrogative). However, from this observation, they conclude that it is possible to define the meaning of the interrogative

embeddings from the meaning of the declarative embeddings. I would argue that this observation cannot be strengthened like this and, based on the data from Table 3.6, I would like to propose following hypothesis:

Hypothesis 9. $\mathbb{E}$:*(Entailment hypothesis) All responsive predicates are either Q-to-P or P-to-Q distributive.*

Observe that this hypothesis is a weakening of both $\mathbb{CD}$ and $\mathbb{PQ}$ and accommodates all the aforementioned counterexamples to these hypotheses. In particular, it accommodates the existence of predicates that are non-veridical but Q-to-P veridical, which are considered by Roelofsen and Uegaki (2021) to be potential counterexamples to their hypothesis (Buryat "*hanaxa*" and Turkish "*bil*"). However, they provide one more potential counterexample, which seems to also violate $\mathbb{E}$. They indicate that the predicate "*magtaka*" in the Tagalog language is translated to English as "to surprise" with declarative complements and as "wonder" while embedding interrogatives. A more detailed study of this predicate is needed to investigate whether it indeed violates $\mathbb{E}$.

3.2 Several interesting predicates

3.2.1 "Dowiedzie si" – to learn

The predicate "dowiedzie si" (eng: "to learn") is interesting because even though it is Q-to-P veridical, it is not veridical. The core observation is that it is possible to "learn" false information and describe this process using a (false) declarative complement. Still, the default meaning of the verb "dowiedzie si" when it embeds a question is that the subject learned the true answer to that question. Therefore this predicate is also not P-to-Q distributive. This pattern constitutes this verb as a counterexample to $\mathbb{V}_1$, $\mathbb{UV}$, $\mathbb{CD}$ ans $\mathbb{QP}$ hypotheses. The meaning of this verb can be described as follows:

- $\ulcorner s$ dowiedziaa si $d\urcorner$ if and only if s did not know that d was the case and some informative event provided s with information that d was true and that s should accept d as true.

- ⌜*s* dowiedziaa si *q*⌝ if and only if *s* did not know the answer to *q* and some informative event provided *s* with the *true* answer to *q* and that *s* should accept this answer as true.

To support this claim I provide some tests from the database. Consider the sentence (6), which is the test of veridicality and the context (8) in which this sentence is true. Since in this context it is not raining, then (6) does not imply that it is raining and thus it is not veridical. Contexts form the news articles like (10) and the fact that sentence (12) is used to describe context (13) support the claim that "dowiedzie si" is not veridical. On the other hand, the sentence (7) seems to be false or at least unassertible about the context (8) the inference (9) is valid. Moreover, observe that sentence (11) contains a question, which the sentence (10) answers, but it is not assertible in the given context; similairly (14) cannot be asserted in the context (13). These tests and data indicate that "dowiedzie si" is neither Q-to-P veridical nor P-to-Q distributive.

(6)   Anna dowiedziaa si,   e   pada.
        Ann   learned   oneself, that it was raining.
        "Ann learned that it was raining."

(7)   Anna dowiedziaa si,   czy   pada.
        Ann   learned   oneself, whether it was raining.
        "Ann learned whether it was raining."

(8)   Anna lives in a windowless flat. Every morning she checks the weather on her smartphone before going out, and usually, the forecast is accurate; thus, she trusts it. Today the app indicated that it was raining (Ann learned from the app that it was raining.), and therefore Anna took her umbrella with her. When she stepped out of the house, the sky was clear, and it was not raining.

(9)   Piotr dowiedzia si,   która zawodniczka wygraa wycig.   Maria wygraa
        Peter learned   oneself, which player   won   the race. Maria won
        ten wycig
        the race.

"Peter learned which player won the race. Mary won the race."

⤳   Piotr dowiedzia si,   e   Maria wygraa wycig.
         Peter learned   oneself, that Maria won   the race.
         " Peter learned that Mary won the race."

(10)   a.   "Constantin Reliu dowiedzia si w styczniu, e ... nie yje. Próbuje co
                prawda udowodni rumuskim wadzom, e jest inaczej, ale napotyka potny
                opór biurokracji".[5]
    b.   In January, Constantin Reliu learned that ... he is dead. He tries to
                prove to the Romanian administration that it is not the case, but he is
                met with strong resistance on their side.

(11)   Constantin dowiedzia si   czy   nie   yje.
       Constantin learned   himself whether NEG he is alive.
       "Constantin learned whether he is dead."

(12)   "Z   aplikacji dowiedzia si,   e   zatrzymano mu prawo jazdy".
       From the app he learned oneself, that suspended   him license driving.
       "From the app he learned that his driving license was suspended".[6]

(13)   a.   "Pan Janusz o tym, e kilka lat temu straci prawo jazdy za przekroczenie
                prdkoci w terenie zabudowanym, dowiedzia si z aplikacji mObywatel".
                [...] Okazuje si, e nie byo zatrzymania przez policj, a starosta nigdy nie
                wyda decyzji administracyjnej o cofniciu panu Januszowi uprawnie do
                kierowania pojazdami.
    b.   Janusz learned from the mObywatel app that his driving license was
                suspended for speeding a few years ago. [...] as it turns out, he was
                never stopped by the police, and there was no administrative decision
                about suspending his right to drive vehicles.

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[5]`https://www.rmf24.pl/fakty/swiat/news-w-styczniu-dowiedzial-sie-ze-nie-zyje-wladze-nie-chca-przyja,nId,2558031#crp_state=1` [access: 01.06.2022]

[6]`https://www.wprost.pl/uwaga/10722472/uwaga-tvn-z-aplikacji-dowiedzial-sie-ze-zatrzymano-mu-prawo-jazdy-nie-bylo-takiego-zdarzenia.html` [access: 01.06.22]

(14)   Janusz dowiedzia si   co   mu zatrzymano.
        Janusz learned   himself what his was suspended.
        "Janusz learned what was suspended."

Nährlich (2022) indicated that learn has similar behaviour pattern in German and English. After consulting some native speakers of English I came to the conclusion that indeed the verb "to learn" seems to be non-veridical, but Q-to-P veridical. Further investigation of this verb by a native speaker should be performed to confirm this judgement, but if the predictions of this section are correct it is indeed a counterexample to the $\mathbb{QP}$ hypothesis postulated by Roelofsen and Uegaki (2021).

3.2.2   "Wyjani" - to explain

As indicated by Roelofsen and Uegaki (2021) the English verb "to explain" has two readings. The reading (15) is called the *explanandum* reading because it means that the subject provided an explanation for the complement (e.g. Lisa said that she ran into Bill because his car was broken and he had to take the bus). The reading (16) is called the *explanans* reading as it means that the complement describes the content of an explanation for something else (e.g. Lisa said that she was late because she ran into Bill.). In Polish the two meanings are distinguished by the particle "to" (see (17) and (18)). This phenomenon may be interesting for studying the role of the particle "to" in clause embedding. The MECORE questionnaire asks the consultants to only consider the explanans reading.

(15)   Lisa explained (the fact) that she ran into Bill at the bus stop.

(16)   Lisa explained that she ran into Bill at the bus stop.

(17)   Anna wyjania   to, e   wpada na   Piotra na przystanku.
        Ann explained it, that she ran into Peter at the bus stop.
        "Ann explained the fact that she ran into Peter at the bus stop."

(18)   Anna wyjania,   e   wpada na   Piotra na przystanku.
        Ann explained, that she ran into Peter at the bus stop.
        "Ann explained that she ran into Peter at the bus stop."

(19)   Anna wyjania   to, która zawodniczka wygraa wycig.
        Ann explained it, which player   won   the race.
        "Ann provided an explanation for the fact that player x_F won the race."

(20)   Anna wyjania, która zawodniczka wygraa wycig.
        Ann explained which player   won   the race.
        "Ann gave an answer to the question: which player won the race."

(21)   Piotr wyjani,   e x_F wygraa wycig.
        Peter explained, that x_F won   the   race.
        "Peter explained that x_F won the race. "

↛   Piotr wyjani,   która zawodniczka wygraa wycig.
        Peter explained, which player   won   the race.
        "Peter gave an answer to the question: which player won the race."

Therefore the interrogative case is bit more complicated the the declarative one. The sentence (20) can be used in different contexts and describe different situations. As a description of context (22), the sentence (20) mean that Anna uses the answer to the embedded question to explain some other fact, but as a description of (23) it states that Anna just answered the embedded question. Therefore (22) provides us with a "pure" explanans reading and the context (23), similarly to the sentence (20) or the premise of the reasoning (21) with something in between the two readings. Therefore the complete meaning of the sentence (20) is (24).

(22)   Kiedy Piotr zapyta Ann o   to, dlaczego nie   dosta nagrody, Anna
        When Peter asked Anna about it why   NEG he got the prize, Anna
        odpowiedziaa, e   (to) Maria wygraa wycig.
        replied   that (it) Mary won   the race.
        "When Peter asked Anna, why he didn't get the prize, Anna replied that (it was) Mary (who) won the race."

(23)   Kiedy Piotr zapyta Ann o   to, kto wygra wycig,   Anna
        When Peter asked Anna about it who won   the race, Anna
        odpowiedziaa, e   Maria wygraa wycig.
        replied   that Mary won   the race.

"When Peter asked Anna, who won the race, Anna replied that Mary won the race."

(24)   "Ann used the answer to the question: which player won the race to explain some other fact. **or** Ann provided an answer to the question: which player won the race "

Thus in Polish the predicate "wyjani" has three readings, when it embeds interrogatives, where reading (1.) corresponds to the explanandum reading and (3.) to the explanans reading:

1. The answer to the complement was explained (the subject provided a (causal) explanation for this answer).

2. The issue raised by the complement was resolved (the subject provided an answer to the complement).

3. Some other (contextually salient) issue was resolved by an answer to the complement (the subject provided a (causal) explanation for some other fact by answering the question in the complement).

Roelofsen and Uegaki (2021) postulated that in English, the verb "to explain" has only the explanandum reading when it takes an interrogative complement. However, it seems that it is not necessarily the case. The sentences (25)-(27) describe situations in which the answer to the embedded interrogative is used to *explain* some other fact (the reading 3.). Moreover, the default interpretation of an embedded interrogative is the "answering the question" one as in (28) (the reading 2.). Thus, from the three interpretations that exist in Polish the "truly" explanans reading (1.), which involves the "to" particle, seems unavailable in English. Thus, when it comes to interrogative complements, the distinction between explanans and explanandum reading needs to be refined.

(25)   When we asked the coach why did the team lost the game, she explained what went wrong.

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(26)   When Peter asked Anna why she won't go out with him, she explained who
         she was and how she was too good for him.

(27)   When I asked my teacher why I did not get the full mark, she explained
         which of my solutions were incorrect.

(28)   Peter explained who won the race.

Observe that intuitively, to describe the act of explaining, two pieces of information
need to be provided: "What is the issue that was resolved (explained)?" and "How
the issue was resolved (explained)?". Following this intuition I propose the following
definitions of the two readings proposed by Roelofsen and Uegaki (2021):

Explanandum: Provides new information about the issue that was resolved.

Explanans: Provides new information about how the issue was resolved, i.e. what proposi-
tion was used to resolve the issue.

In the declarative case, the definitions of the two readings provided by Roelofsen
and Uegaki (2021) and me coincide: If a sentence states that the subject provided
an explanation for the complement d, then it gives us new information that the issue
raised was roughly: "why d?" (explanandum). If a sentence states that a proposition
p was the content of the explanation then it states that p was used to resolve the issue
(explanans). However, for the interrogative case my definition can classify all three
ways in which this verb is used: The first one (where the answer to the complement
was explained) provides information about the issue that was resolved. As in the
declarative case, if q is an embedded interrogative then "why a_q?" is the "default"
resolved issue. The second reading (where the complement q is resolved/answered)
also provides new information about the issue that was resolved. In this case if q is an
embedded interrogative then also q is the resoled issue. However, it does not provide
any information on how the issue was resolved. Therefore the first two meanings
fall under the category of the *explanandum* reading. However, the third one (where
some other issue is resolved by an answer to the complement), provides information

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about how the issue was resolved. If q is an embedded interrogative, then a_q was the proposition used to explain some (other) contextually salient issue. Therefore the third reading is the *explanans* reading.[7]

Having resolved the issue with the meaning of the predicate "wyjania" when it embeds interrogative complements, we can analyse the properties of the explanans reading of this predicate, as required in the MECORE questionnaire.

Under the explanans reading the verb "wyjani" is not veridical because sentences like (31) can be meaningfully and truthfully uttered in the insincere contexts like (32). As mentioned above, this verb may seem not P-to-Q distributive, as (31) implies (33) and not (32). However, as I already established, the default reading of the sentence (32) is the explanandum reading. It is difficult to just derive a corresponding interrogative-explanans example from (31), but it should be something like (34), which is true in the context (32) and thus we should judge "wyjani", under the explanans reading, as P-to-Q distributive. It is much easier to check whether it is Q-to-P veridical. As it turns out it is not, as sentences presented in (35) seem to be consistent and describe a plausible context and thus "wyjani" is not Q-to-P veridical. However, typically in the contexts like (25)-(27) the predicates "to explain" and "wyjania" are Q-to-P veridical.

(30)   When the boss asked Anna why she was late for work, she said (explained) that it was raining. She was lying, because in fact it was not raining and she was late, because she overslept.

(31)   ✓Anna wyjania,   e   padao.
        Ann   explained, that it was raining.
        "Ann explained that it was raining."

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[7]There seems to be another meaning of the verb "wyjani" in Polish, which can be described as "find the true answer to the a question" as in a sentence:

(29)   Proces   wyjani   kto zabi ofiar.
        The trial explained who killed the   victim.
        "The trial found/discovered the truth about who killed the victim." It seems to be Q-to-P veridical, and thus relevant for the constraints like $\mathbb{UV}$ and $\mathbb{QP}$.

A separate study should be performed to determine whether this meaning is relevant to the properties of this predicate.

(32) #Anna wyjania, czy   padao.
      Ann   explained, whether it was raining.
      "Ann explained whether it was raining."

(33) ✓Anna wyjania, dlaczego si   spónia.
      Ann   explained, why   herself was late.
      "Ann explained why she was late."

(34) Kiedy szef   spyta Ann dlaczego si   spónia, Anna wyjania,
      When the boss asked Anna why   herself was late, Ann   explained,
      co   si   stao.
      what oneself happened.
      "When the boss asked Anna why she was late, she explained what happend."

(35) a. Kiedy spytaem szefa dalczego nie odpowiedzia na mój e-mail, wyjasni mi
          ile maili dziennie otrzymuje. Jednak wiem od jego sekretarki, e dostaje
          mniej wicej dwa w tygodniu.

      b. When I asked my boss why she did not respond to my e-mail, she ex-
          plained how many e-mails he gets daily. However, I know from his
          secretary that she only gets approximately two a week.[8]

My investigations of the predicate "to explain" suggest that it should mean some-
thing like "to resolve a contextually given issue". This analysis of the verb explain is
supported by the frequently used phrases like (36) and (37) , which indicate that an
explanation fails if the issue is not resolved in the context. A further formal analysis
should be performed to fully investigate this predicate.

(36) Anna tried to explain that she does not work there, but the costumer would
      not listen and still shouted at her.

(37) Anna tried to explain to her parents (the fact that) she did not pass the
      exam, but they were still disappointed.

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[8]I would like to thank Floris Roelofsen for this example.

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Because of ambiguity, the verb "wyjani", similarly to the English "explain" is difficult to assess and work with. Therefore a separate empirical study should be performed to properly evaluate its properties. An example of such a study for another predicate can be found in Chapter 4.

3.2.3   "Martwi si" - to be worried, "ba si" - to fear and "narzeka" - to complain

The predicate "martwi si" is a *negative* preferential predicate as it expresses a negative preferential attitude towards a proposition. Uegaki and Sudo (2019) indicates that other characteristics that are relevant for preferentiality predicates i.e. focus sensitivity and gradability; "martwi si" satisfies these properties as (38) is a valid inference and (39), (40) and (41) are well-formed sentences in Polish.

(38)   Anna martwi   si,   e   Piotr bdzie uczy skadni we WTOREK.
        Ann   is worried oneself, that Peter will   teach syntax on TUESDAY.
        "Ann is worried that Peter will teach syntax on TUESDAY "

$\not\rightsquigarrow$ Anna martwi   si,   e   Piotr bdzie uczy skadni.
        Ann   is worried oneself, that Peter will   teach syntax
        " Ann is worried that Peter will teach syntax."

(39)   Anna bardzo martwi si,   e   pada.
        Ann   very   be   worried oneself, that   it is raining.
        " Ann is worried very much that it is raining. "

(40)   Anna martwi   si,   e   pada,   bardziej ni   Piotr.
        Ann   is worried oneself, that it is raining more   than Peter.
        " Ann is worried that it is raining more than Peter does. "

(41)   Anna martwi   si   tym   e   pada,   bardziej ni   tym,
        Ann   is worried oneself (it$_i$nst), that it is raining more   than (it$_i$nst)
        e   jest   zimno.
        that it is cold.
        " Ann is worried that it is raining more than that it is cold."

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Moreover, predicate "martwi si" is not veridical, as (44) can be truthfully asserted in the context (43). However, as exemplified by (44), (45) and (46) it is responsive and thus it violates the $\mathbb{NVP}$ hypothesis.

(42) Anna martwi si,   e   pada.
      Ann   is worried oneself, that it is raining.
      "Ann is worried that it is raining."

(43) Anna lives in a windowless flat so she does not know what the weather is like.
      Today she has an important meeting in a park, which will not take place if it
      will be raining; therefore Anna does not want it to rain, but she thinks that
      it is possible that it is raining.

(44) ?Anna martwi   si,   czy   pada.
      Ann   is worried oneself, whether it is raining.
      "Ann is worried whether it is raining."

(45) Anna martwi   si,   czy   Maria wygraa wycig.
      Ann   is worried oneself, whether Mary won   the race.
      "Ann is worried whether Mary won the race."

(46) Anna martwi   si,   która zawodniczka wygraa wycig.
      Ann   is worried oneself which player   won   the race.
      "Ann is worried which player won the race."

Interestingly, as indicted by the examples (47) , (48) and (49), the English predicate "to be worried", similarly to its translation to Polish, is responsive and thus require a separate study to be properly investigate. This behaviour may occur due to the fact that unlike predicates like "hope" the predicate "to be worried" is negative in the sense described above. However, as mentioned above, to derive anti-rogativity of the non-veridical preferentials Uegaki and Sudo (2019) proposed that an utterance of (a non-veridical) preferential predicate presupposes the *Threshold Significance*, i.e. that "[there is] an element in the comparison class whose degree along the relevant scale [of preference] is higher than the threshold."(Uegaki and Sudo, 2019, p.335). However, this presupposition seems not to be triggered, at least in the interrogative case for

"martwi si" or "be worried", as inferences like (50) and (51) are not valid in contexts like (52), i.e. this predicates seem to violate Q-to-P distributivity. A separate study should explain and accommodate this behaviour.

(47)   "Claudia Martin is worried whether she'll earn enough in tips to make ends meet." [9]

(48)   "But Im also worried who will fill the gap if and when I have to take leave due to my own Covid-19 infection." [10]

(49)   "I am worried where my son will go for the rest of his high school career." [11]

(50)   Piotr martwi   si,   która zawodniczka wygraa wycig
        Peter is worried oneself, which player   won   the race.
        "Peter is worried which player won the race. "

$\not\rightsquigarrow$ Piotr martwi   si,   e x_F wygraa wycig.
        Peter is worried oneself, that x_F won   the race.
        " Peter is worried that x_F won the race."

(51)   Peter is worried who won the race.
        $\not\rightsquigarrow$ Peter is worried that x_F won the race.

(52)   Peter is a prince who needs to marry the winner of the race. He knows nothing about the participants but it still matters to him who will win the race.

Even stronger claim can be made about the predicate "ba si" (eng: *to fear*). It is also a preferential, non-veridical predicate that, in Polish, is responsive. However,

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[9] https://www.washingtonpost.com/business/2020/06/06/workers-pay-cuts-coronaviru s/ [access: 06.06.2022; found using the *NOW* corpus.]

[10] https://www.theguardian.com/world/2020/sep/14/coronavirus-86-per-cent-of-docto rs-in-england-expect-second-wave-in-next-six-months [access: 06.06.2022; found using the *NOW* corpus.]

[11] https://apnews.com/press-release/globe-newswire/new-jersey-trenton-newark-char ter-schools-education-b428743cf95d1d1b7a357ab893c3b457 [access: 06.06.2022; found using the *NOW* corpus.]

when it embeds interrogatives, as it is not only not Q-to-P distributive but also ignorance entailing, as indicated by (53). This behaviour of "ba si" also rejects the *Threshold Significance* presupposition. I leave the explanation of this behaviour for a further study.

(53)   Piotr boi si,   która zawodniczka wygraa wycig
        Peter fear oneself, which player   won   the race.
        "Peter fears which player won the race. "

⤳   Piotr nie   wie,   która zawodniczka wygraa wycig.
        Peter NEG knows, which player   won   the race
        " Peter does not know which player won the race."

⇸   Piotr boi si,   e x_F wygraa wycig.
        Peter fear oneself, that x_F won   the race.
        " Peter fears that x_F won the race."

The predicate "narzeka" seem to violate the *Threshold Significance* presupposition, as it is not Q-to-P distributive. In the contexts (54) the sentence (55) seem to be true and, in this context, (55) does not imply (56).

(54)   *Colonel*: My troops are a disaster. I only have criminals and gangsters under
        my command. I hate every day of it.

(55)   ✓Pukownik narzeka   na   to, kto suy   w jego oddziale.
        The colonel complains about it, who serves in his   regiment.
        "The colonel complains, who serves in his regiment."

(56)   #Pukownik   narzeka   na   to, e x_F suy   w jego oddziale.
        The colonel complains about it, that x_F serves in his   regiment.
        "The colonel complains that x_F serves in his regiment."

3.2.4   "aowa" - to regret

As mentioned above, Egré (2008) claims, in the defence of the hypothesis $\mathbb{V}_2$, that the English verb "to regret" is not veridical, but only belief entailing. To answer

this defence for the Polish language translation of this predicate "aowa", I provide the context (57) in which, to maintain Egré (2008)'s defence, we should be able to truthfully assert the sentence (58). In my opinion, (58) seems false or at least infelicitous in this context, but the intuitions of other native speakers vary. Therefore, a proper empirical study in various languages should be performed to investigate whether it is really the case. Below I present some important remarks that any researcher performing such a study should have in mind.

First of all, in all known cases, if a predicate is veridical, it also does not allow for complement cancellation.[12] Therefore, except just checking the assertability of sentence (58), the study should also test whether sentences like (59) or (60) are well-formed. The intuitions of the native speakers are more clear, and most of them claim that there is something wrong with these sentences, as they seem to be contradictory. However, some are still convinced that these sentences are more or less correct. Thus investigating these sentences may lead to interesting conclusions regarding the verb "aowa" or "*regret*".

(57) a. Piotr zaprosi Ann na randk. Jego zy brat bliniak - Pawe - postanowi zepsu bratu relacj i pojawi si na spotkaniu z Ann zamiast brata. Przez cay wieczór Pawe zachowywa si okropnie, wic Anna auje, e to spotkanie si odbyo. Anna do tej pory jest przekonana, e bya na randce z Piotrem a nie z Pawem.

    b. Peter invited Anna for a date. His evil twin - Paul - decided to destroy his brother's relationship and showed up at the meeting with Anna instead of Peter. During the evening, Paul was very rude, and thus Ann regrets that this meeting happened. However, Ann is still convinced that she met with Peter, not Paul.

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[12]Using the representational framework from Section 1.3.1 we can clearly see that the condition for V being veridical: $\ulcorner sVd \urcorner \Rightarrow \ulcorner d \urcorner$ implies that $\ulcorner sVd \urcorner \wedge \ulcorner \neg d \urcorner$ is a contradiction and thus that $\ulcorner sVd \; \neg d \urcorner \Rightarrow \bot$. Therefore if a predicate V is veridical then the first conjunct of the condition for complement cancelability: $[\ulcorner sVd \; \neg d \urcorner \not\Rightarrow \bot] \wedge [\neg(\ulcorner sVd \urcorner \Rightarrow \ulcorner \neg d \urcorner)]$ is not satisfied by V and thus V does not allow for complement cancellation. However, a proper logical formalism should be developed to turn this reasoning into a proper logical proof.

(58) %Anna żałuje, że poszła na randkę z Piotrem.
      Ann   regrets, that she went to date   with Peter.
      "Ann regrets going on a date with Peter."

(59) ?Anna żałuje, że poszła na randkę z Piotrem, ale tak naprawdę
      Ann   regrets, that she went to date   with Peter,   but (like) in fact
      poszła na randkę z Pawłem.
      she went to date   with Paul.
      "Ann regrets going on a date with Peter, but in fact she went on a date with Paul."

(60) ??Anna poszła na randkę z Pawłem, ale żałuje, że poszła na randkę
      Ann   went to date   with Paul,   but regrets, that she went to date
      z Piotrem.
      with Peter.
      "Ann went on a date with Paul, but she regrets going on a date with Peter."

Investigation of predicates like "żałowa" may also lead to interesting conclusions regarding the property of veridicality. As mentioned above, Egré (2008)'s motivation to discuss this property is the fact that it is the main semantic difference between "know", which is responsive and "believe" or "think", which are anti-rogative in neutral contexts. If we consider these verbs in the context of this story, the judgements are very clear (see sentences (61)- (66)). It seems that "żałowa" lies somewhere on the spectrum, which starts with a non-veridical "think" and ends with the veridical "know". Perhaps it is at one extremum or the other, but the evidence suggests it is somewhere between the two ends. The future study should consider it possible that "żałowa" may undermine the assumptions of the MECORE project, i.e. that all the semantic properties are binary, similarly to the predicate "spodziewa si", that I discuss in Chapter 4 (see Section 4.2 for the discussion of this issue.).

(61) #Anna wie, że poszła na randkę z Piotrem.
      Ann   knows, that she went to date   with Peter.
      "Ann knows going on a date with Peter."

(62) *Anna wie, e posza na randk z Piotrem, ale tak naprawd
      Ann knows, that she went to date with Peter, but (like) in fact
      posza na randk z Pawem.
      she went to date with Paul.
      "Ann knows that she went on a date with Peter, but in fact she went on a
      date with Paul."

(63) *Anna posza na randk z Pawem, ale wie, e posza na randk
      Ann went to date with Paul, but knows, that she went to date
      z Piotrem.
      with Peter.
      "Ann went on a date with Paul, but she knows that she went on a date with
      Peter."

(64) ✓Anna myli, e posza na randk z Piotrem.
      Ann thinks, that she went to date with Peter.
      "Ann thinks going on a date with Peter."

(65) ✓Anna myli, e posza na randk z Piotrem, ale tak naprawd
      Ann thinks, that she went to date with Peter, but (like) in fact
      posza na randk z Pawem.
      she went to date with Paul.
      "Ann thinks that she went on a date with Peter, but in fact she went on a
      date with Paul."

(66) ✓Anna posza na randk z Pawem, ale myli, e posza na randk
      Ann went to date with Paul, but thinks, that she went to date
      z Piotrem.
      with Peter.
      "Ann went on a date with Paul, but she thinks that she went on a date with
      Peter."

Chapter 4

Experimental study of the predicate "spodziewa si" - *to expect*

In this chapter, I discuss the properties of the predicate "spodziewa si". This predicate turned out to be very interesting as I first judged it as neg-raising and responsive, which would violate the $\mathbb{NR}$ hypothesis, and I suspected it to be not P-to-Q veridical, which would violate the $\mathbb{CD}$ and $\mathbb{QP}$ hypotheses. However, I had some difficulties in determining the properties and meaning of this verb when it embeds questions. Thus, I decided to run an experiment that would investigate this predicate's relevant properties. In the first section of this chapter, I present the method of the experiment and the collected data. In the second part, I discuss the results and provide some insight into the semantics of the predicate "spodziewa si" as well as the method of the MECORE project.

4.1   The survey - method and results

The survey investigates five semantic properties of the clause-embedding predicate "spodziewa si" (eng: *to expect*):

1. Veridicality

2. Projectivity under negation

3. Neg-raising

4. P-to-Q distributivity

5. Q-to-P distributivity

The survey was created and distributed using the Qualtrics (2022) tool. Overall, 96 people filled in the survey. All of them confirmed that they are over 18 years old, participated in the survey voluntarily and that they are native speakers of Polish. The were informed about their rights and of the approval of the project by the Ethics Committee of the Faculty of Humanities of the University of Amsterdam (see the legal information in Appendix C). The survey's questions and answers were presented in Polish; to allow the international audience to understand the questions, I provided their descriptions in English in this section. The reader can find the original survey (in Polish and English) in Appendix C. The remainder of this section discusses the method of investigating the properties of the predicate "spodziewa si" and the "raw" results of this study.

4.1.1 Veridicality

The question that investigates the veridicality of the predicate "spodziewa si" consists of a story, which makes it clear that Ann has an expectation that Peter will propose to her today and that, in reality, he will not do that. The verb "spodziewa si" does not appear in the story. The participants are asked to assess whether the sentence (1) is true in this context. If the respondents consider this sentence true, then we can conclude that the predicate "spodziewa si" is not veridical since it can be used in a context where the complement is false. If they assess the sentence as false, we can conclude that the predicate is veridical. The answers of the respondents are represented on the chart 4.1. Since a vast majority of the participants judged this sentence to be true, we can conclude that the predicate "spodziewa si" is not veridical.

(1)   Anna spodziewa si,   e   Piotr dzi   si   jej   owiadczy.
        Ann   expects   oneself, that Peter today himself to her will propose.

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"Ann expects that Peter will propose to her today."
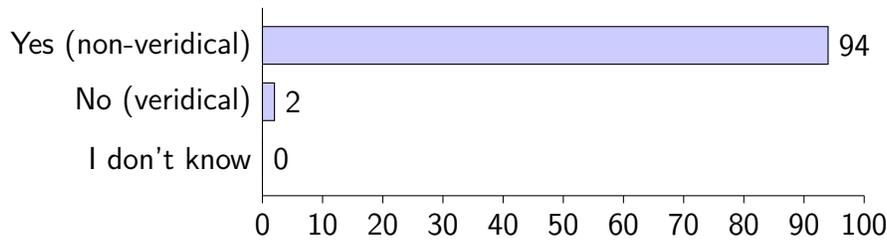
Chart 4.1: Veridicality

4.1.2 Projectivity under negation

The survey part that investigates the predicate "spodziewa si" with respect to the property of being projective under negation consists of two questions. In the first one, the participants are asked to assess whether sentence (2) is **always** true in a context which explicitly contains sentence (3); in the second part, they are asked if the negation of sentence (2) is a good continuation of this context (without sentence (2)). The first part explicitly represents the property in question and the second part is there to check the consistency of this judgement. This time the answer "Yes" suggests that the predicate is projective under negation, and the answer "No" that it is not. In the second part, the higher the value, the more likely the predicate is not projective under negation.

Majority of the participants answered "No" to the first question, as shown by the chart 4.2. Only 89 participants answered the second part of the question, but this did not influent the results, as of the participants who did not answer this part, 6 voted "No" in the first part and only 1: "I don't know". As we can see from the chart 4.3 more people decided that the story is a good continuation (62) than that it is a bad continuation (23). Moreover, a bigger percentage of people who answered "No" stayed consistent with their judgement in the second part, as represented by the chart 4.4. Therefore we can conclude that the predicate "spodziewa si" is not projective under negation. However, observe that the judgement was not as clear as in the case of veridicality.

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(2)   Marcin dzi   owiadczy   si   Marzenie.
        Marcin today will propose himself to Marzena.
        "marcin will propose today to Marzena."

(3)   Marzena nie   spodziewa si,   e   Marcin dzi   si   jej
        Marzena NEG expects   oneself, that Marcin today himself to her
        owiadczy.
        will propose.
        "Marzena does not expect that today Marcin will propose to her."
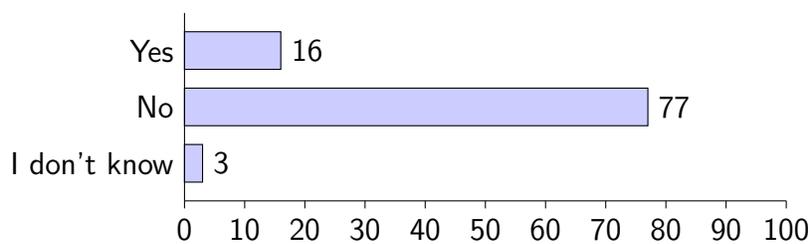
Chart 4.2: Projectivity under negation.
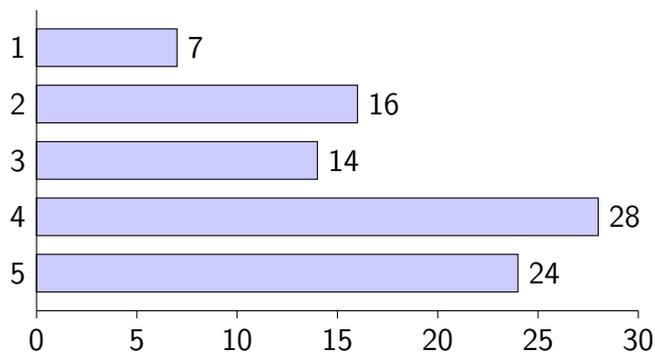
Chart 4.3: Projectivity under negation – consistency test. Where the value 1 means
that the negation of the complement, as a continuation of the story "does not make
any sense" and 5 that it "is a completely natural continuation."
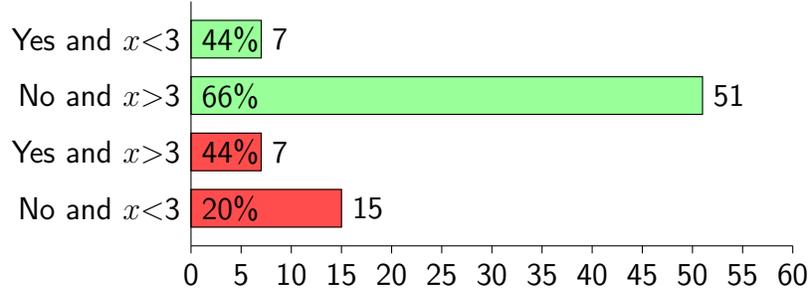
Chart 4.4: Consistency: The two upper (green) bars represent the levels of consistency for each answer i.e. the percentage of people who did not "change their mind" between the questions and the two lower (red) bars represent the levels of inconsistency.

4.1.3 Neg-raising

In the survey part that investigates the property of Neg-raising, participants have to read a story about Peter, who wants to surprise Anna on her birthday with a visit from a football star Robert Lewandowski. In this context, it is clear that Anna does not know that Robert will be at the party, but it is also clear that he will come. In the second version of the story, a sentence is added to make it explicit that Anna does not even consider it possible that Robert could come to the party. The second context was supposed to cancel the eventual excluded middle presupposition that could arise in the first case. The participants are asked to assess whether the sentence (5) is true in this context. The answer "Yes" in both questions suggests that the predicate is neg-raising and the answer "No" that it is not.

Before performing the actual test, I wanted to make sure that the participants judge the premise of the inference (i.e. sentence (4)) as true in the specified context. Therefore I tested the participant in a context of the same structure with different names and events. 82 participants answered that sentence (4) is true in this context (11 answered "No" and 3 "I do not know"), and thus I considered only their answers in the main part of the test.

The result of the first part of the actual test suggests that the predicate is not neg-raising as the majority of the participants answered "No". In the second test, more people answered "No" as well, but many people changed their mind and answered

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"Yes" instead, so the result is much less clear.

(4)   Joanna **nie** spodziewa si,   e   Robert Lewandowski przyjdzie na
      Joanna NEG expects   oneself that Robert Lewandowski will come to
      przyjcie.
      the party
      "Joanna expects that Robert Lewandowski will not come to the party."

(5)   Joanna spodziewa si,   e   Robert Lewandowski **nie**   przyjdzie na
      Joanna expects   oneself that Robert Lewandowski NEG will come to
      przyjcie.
      the party
      "Joanna expects that Robert Lewandowski will not come to the party."
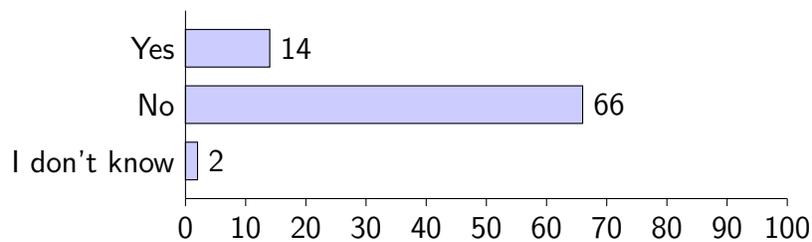
Chart 4.5: Neg-raising A
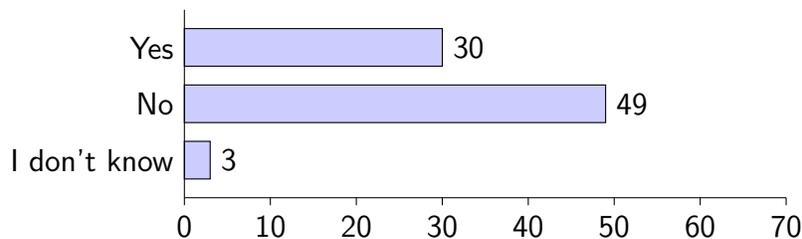
Chart 4.6: Neg-raising B – with cancellation.

4.1.4   P-to-Q and Q-to-P distributivity

The last and the longest part of the survey investigates the relationship between the
declarative complements (P) and the interrogative complements (Q) embedded under

the predicate "spodziewa si" or its negation (represented as $\neg P$ and $\neg Q$ respectively)[1]. In the first phase of this part, the participants are presented with four stories of the form (6) (one by one), and for each story, they are asked to assess whether a sentence of the form $P(7)$, $\neg P(8)$, $Q(9)$ or $\neg Q(10)$ is true. The sentence is randomly assigned from the set of sentences, but all participants assess one sentence of each form. Due to random assignment, we avoid a potential bias that could arise by order of the questions asked or if all the questions were asked at the same time for the same story (see Section 4.2.2). In the second phase, the participant has to read a story that differs from the previous one only in the fact that the subject S explicitly states that they expect that A won the competition C.

(6)   The subject S is unaware of the outcome of the just-finished competition C. S thinks that contestant A won the competition, but in fact, contestant B won the competition.

(7) S spodziewa si,   e A wygraa zawody C.
        S expects   oneself that A won   the competition C..
        "S expects that A won the competition C."

(8) S nie   spodziewa si,   e B wygraa zawody C.
        S NEG expects   oneself that B won   the competition C.
        "S does not expect that B won the competition C."

(9) S spodziewa si   kto wygra zawody C.
        S expects   oneself who won   the competition C.
        "S expects who won the competition C."

(10) S nie   spodziewa si   kto wygra zawody C.
        S NEG expects   oneself who won   the competition C.
        "S does not expect who won the competition C."

The chart 4.7 presents the joint results and answers to all questions, and the chart

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[1]Please be aware that this notation, that is used for convenience, may be confusing. It is not the complement that is negated, but the predicate. Let's represent this dependency with an example to avoid the confusion; if we take P to be: *Alfred knows that Bertrand left.* then $\neg P$ would denote the sentence: *Alfred **does not** know that Bertrand left.*.

4.8 the answers to Q and $\neg Q$ scenarios of people who answered "yes" to both P and $\neg P$ scenario. (Observe that P and $\neg P$ can be consistent since their complements refer to different competitors.) This chart is most relevant for the properties in question in this subsection. Interestingly, 48 people answered "yes" to both Q and $\neg Q$. The chart 4.9 presents the results of the second phase.

The results of this part are surprising, since they do not allow to determine, whether the predicate "spodziewa si" is P-to-Q or Q-to-P distributive. Since the method of the MECORE project assumes that each predicate satisfies or does not satisfy each property, the response charts should look similar to those for veridicality or projectivity under negation. Therefore it is unexpected that there is a significant disagreement between the respondents on the properties in question. Since it also occurs in the "explicit" scenario, some explanation is required. I discuss this issue in more depth in the next section.
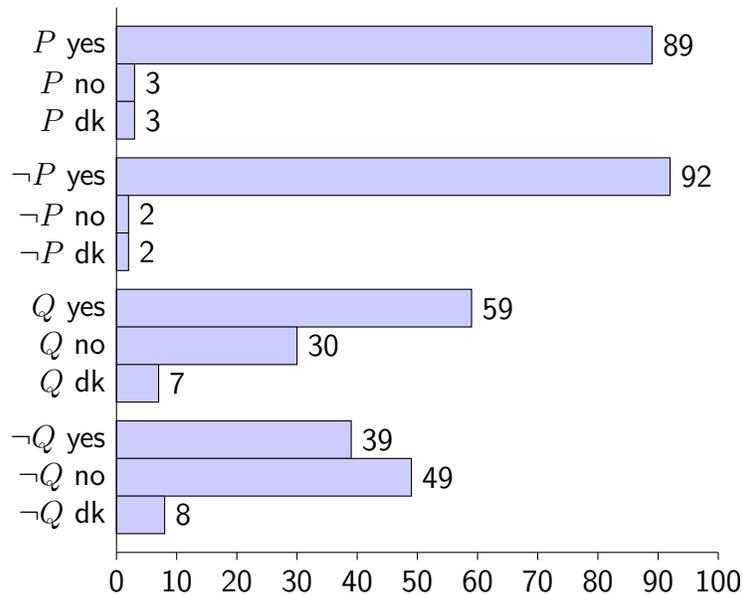
Chart 4.7: Relation between P and Q
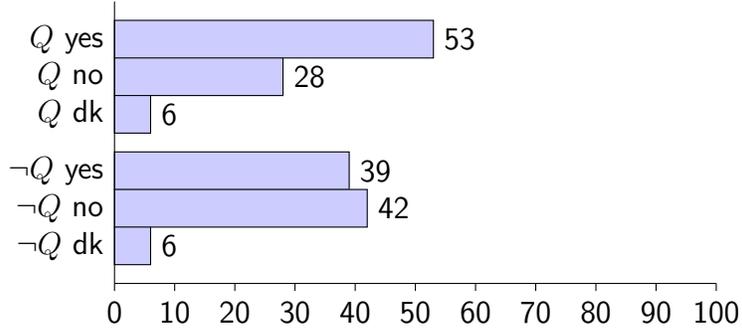
Chart 4.8: Relation between P and Q of participants who answered "yes" to both P and $\neg P$
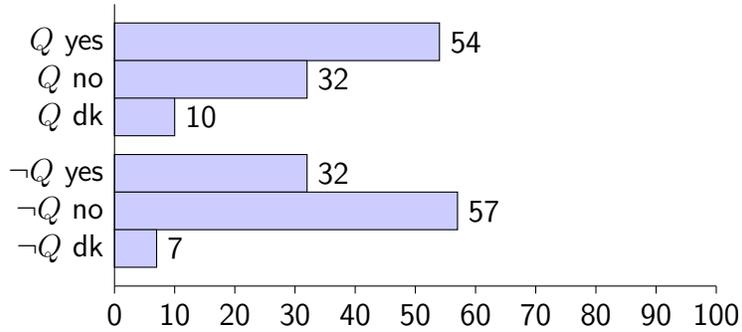
Chart 4.9: Relation between P and Q in the explicit P scenario

4.2 Discussion of the method and the results

In this section, I will discuss the results of the survey presented above in light of the current state of the art research in clause-embedding predicates as presented in Chapter 1 as well as the method of the MECORE project as discussed in Chapter 2. In the first part, I will present some conclusions concerning the properties that involve declarative complements. In the second, I will discuss the problematic results regarding the relation between declarative and interrogative complements.

4.2.1 Semantic properties concerning the declarative complements

As mentioned above, the responses to the first question indicate that the predicate "spodziewa si" is not veridical, as a significant majority of the respondents agreed that a sentence of form $\ulcorner sVp \urcorner$ can be truthfully asserted in a context in which its complement ($\ulcorner p \urcorner$) is false. This result is unsurprising, as this predicate seemed non-veridical in the first place. I performed this test to confirm this intuition empirically.

I also expected that the results concerning projectivity under negation would be less apparent but still allow us to conclude that "spodziewa si" is not projective under negation. First of all, the verb "spodziewa si" under negation is typically used to inform someone that some surprise awaits the subject of the sentence. Thus some respondents may be influenced by this. Secondly, the test was a bit more difficult to process than the first one, as it asked whether the complement (p) is always true given that $\ulcorner s\neg Vp \urcorner$ is asserted. I think that it would be better to construct a context in which the complement is false and see if $\ulcorner s\neg Vp \urcorner$ is assertible (similarly the veridicality test.). However, I could not construct a context that would not make some assumptions about the subject's epistemic states, which could influence the results.

To accommodate these difficulties, I ran an additional test in which the sentence of the form $\ulcorner s\neg Vp \urcorner$ is followed by the negation of the complement ($\ulcorner \neg p \urcorner$). The second question tested whether the respondents would stay consistent in their judgements and confirmed the first test's results, but the answers again were not unanimous. The test of projectivity under negation could be improved for further experiments to avoid the issue, but the one performed here still allowed to conclude that, as expected, the predicate "spodziewa si" is not projective under negation.

Neg-raising was the first property that was tested because of its relevance to the hypotheses. The test inference given in the MECORE questionnaire is presented in (11). Since the verb "spodziewa si", without any context, is most naturally used for future events, then I decided to change the tense of all the tests to avoid issues with an unnatural use of present tense. Unfortunately, the complement "it will be raining." seem to trigger a pragmatic excluded middle presupposition because if we bring up

someone's expectations regarding the weather at some point in the future, then for it to be relevant, they must have some expectation about it. Therefore, following the testing method, I judged this predicate to be neg-raising. Since "spodziwa si" is responsive, it would become a counterexample to the $\mathbb{NR}$ hypothesis. Therefore I decided to perform an additional test (12) to verify my judgement. My intuitions were that it was not a valid inference in the contexts where we know that Ann has no expectations about Peter being at the party. However, since one of the features of the neg-raising inference is that it is easily cancellable, I decided to subject this property to an experiment. My prediction was that the predicate "spodziwa si" was non- neg-raising, but that it is very sensitive to the context of utterance.

(11)   Anna nie   spodziewa si,   e   bdzie   pada.
       Ann   NEG expects   oneself, that it will be raining.
       "Ann doesnt expect that it will be raining. "

⤳   Anna spodziewa si,   e   nie   bdzie   pada.
       Ann   expects   oneself that NEG it will be raining.
       " Ann expects that it will not be raining."

(12)   Anna nie   spodziewa si,   e   Piotr przyjdzie na przyjcie.
       Ann   NEG expects   oneself, that Peter will come to the party..
       "Ann doesnt expect that Peter will come to the party. "

↛   Anna spodziewa si,   e   Piotr nie   przyjdzie na przyjcie.
       Ann   expects   oneself that Peter NEG will come to the party..
       " Ann expects that Peter will not come to the party."

In case my prediction was incorrect, and the participant assessed that "spodziewa si" was neg-raising, I added a scenario in which the excluded middle presupposition is cancelled, i.e. which makes it explicit that the subject has no expectations about the complement happening. As I predicted, most people answered "No" to the first question. However, according to the second prediction most of people who answered "Yes" should switch their answer to "No" after the cancelling. Surprisingly, only 2 people changed their vote from "Yes" to "No", but 18 people changed from "No" to "Yes". It is difficult to explain this behaviour, but it confirms that the predicate "spodziewa

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si" is extremely sensitive to context change. It seems that the additional sentence somehow triggered the excluded middle presupposition, even though it should not. Since there are no strong NPIs in Polish, it is impossible to run a test that uses them to confirm that "spodziewa si" is neg-raising.

However, from the first part of the test, we can still conclude that it is possible to construct a context for the predicate "spodziewa si" in which the neg-raising inference is invalid and in which the excluded middle presupposition does not seem to be cancelled. Therefore, this predicate is non-neg-raising. In future research of this predicate, it would be interesting to construct a more detailed experiment that would provide a better understanding of the contexts which trigger or cancel the excluded middle presupposition. The study of the neg-raising property could also benefit from such an experiment, and "spodziewa si" seems to be a perfect candidate because of its context sensitivity.

4.2.2   Issues with the interrogative complements

According to the assumptions made by the MECORE questionnaire and this thesis, each predicate either satisfies or does not satisfy a property if it applies to that predicate (e.g. P-to-Q veridicality does not apply to the predicate "believe" as it does not accept interrogative complements). Therefore the judgement of a test in the survey should be more or less consistent among the participants, i.e. the charts representing the satisfaction of the property should look like the one that represents the answers on veridicality (Chart 4.1).

However, when it comes to the part of the survey that investigates the relations between declarative and interrogative complements, there is a variation in participants' intuitions, and the charts are much more balanced. People disagree whether the sentences of the form Q and $\neg Q$ are true or false in the context of provided stories. Therefore, either the design of this part of the survey was wrong, or some linguistic complications arose when the predicate "spodziwa si" embedded interrogatives or the assumptions of the MECORE project are partially incorrect. In this section, I will argue my design is correct and that at least one of the other two is the case.

Potential objections to the survey's method

I already addressed potential issues while designing the survey. Since people tend to stay consistent with their previous judgements, the order of the statements they are asked to judge may matter (e.g. If one already said that P is true, they may hesitate to say that $\neg Q$ is also true). Similarly, if they were asked to judge all the statements simultaneously, they might try to reach some imagined consistency, which could influence the results.

To address this issue, I randomly divided the participants into four groups with different ordering of the statements but the same ordering of the stories (each story has the same general structure but different details). In the Table 4.1 I present the results of each group, which indicate that the ordering of the statements does not have a significant impact on the participants. The only two values that stand out are in the third row i.e. more people are willing to accept the sentence of the form Q if prompted before all the other sentences. The impact of this bias should be balanced by the randomisation of the ordering.

Moreover, to minimise the impact of the ordering, I use a different story of the same structure for each statement, which should reduce the "feeling" of giving inconsistent answers and keep the participants engaged in the survey. One may argue that, since the stories are different, we should not draw any conclusions regarding the inferences between them. However, keeping the structure constant makes the method a sound way of investigation.

	P			$\neg P$			Q			$\neg Q$		
Ordering	YES	NO	DK	YES	NO	DK	YES	NO	DK	YES	NO	DK
$P,\ \neg P\ ,\ Q,\ \neg Q$	22	0	2	24	0	2	14	6	5	13	10	2
$\neg P, P,\ \neg Q,\ Q$	21	2	1	23	1	0	14	9	1	9	12	3
$Q,\ \neg Q,\ P,\ \neg P\ ,$	24	1	0	24	0	1	**19**	6	0	8	**15**	2
$\neg Q,\ Q\ ,\ \neg P, P$	22	0	0	21	1	0	12	9	1	9	12	1

Table 4.1: Answers to the last part of the survey with respect to the ordering of the statements.

In the survey, I did not explicitly test the responsivity of the predicate "spodziewa si" since it was evident that it is responsive and would make the survey even longer.

However, since the English predicate "to expect" cannot embed interrogatives in normal contexts, some may raise the following objection to the method of the study:

Since the participants were not explicitly asked about the embedding of interrogatives, they could accept an ungrammatical sentence as a correct one, which could cause some variation in the results. Intuitively, if people had found a sentence ungrammatical, they would answer, "I don't know."; however, they could still refrain from doing so and feel forced to choose "Yes" or "No" as an answer.

To challenge this objection, I provide below some examples from the Internet ((13)-(16)) which confirm that "spodziewa si" can very naturally embed interrogatives in many contexts and, therefore, that it is unnecessary to include a test of this kind in the survey, as it would not cause any significant difference in the results:

(13)   Kto   ledzi   mnie na Facebooku lub Instagramie, zapewne
       Whoever follows me   on Facebook   or Instagram,   undoubtedly
       spodziewa si,   który z zakupionych lakierów   na Allepaznokcie.pl
       expected oneself, which of bought   (nail) polishes at Allepaznokcie.pl
       wylduje   w notce   jako pierwszy.
       will end up in the note as   first.
       "If someone followed me on Facebook or Instagram then they must already

       expect which of the nail polishes that I bought will be the first one under the

       review."[2]

(14)   Czy spodziewaa si,   który z duetów   bdzie   lepszy tym razem?
       Did she expect herself, which of the duets will be better this time?
       "Did she expect which of the dancing pairs will be better this time?"[3]

(15)   Tobolczyk spodziewa si,   kto moe wygra wybory parlamentarne.
       Tobolczyk expected   oneself, who may win   the parliamentary election.
       "Tobolczyk expected who may win the parliamentary election." [4]

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[2]https://paznokciowelovee.blogspot.com/2014/09/allepaznokcie-flip-flop-kameleon-02.html
[3]https://www.polsat.pl/news/2021-10-26/iwona-pavlovic-po-finale-tanca-z-gwiazdami-to-byla-perelka/ [access: 02.04.2022]
[4]http://panoramakutna.pl/tobolczyk-bezpartyjni-samorzadowcy-moja-kampania-nie-byla-bogata-ale-czulem-wsparcie/ [access: 02.04.2022]

(16) Gdy skradziono jedynego Moneta w Polsce, nikt nie spodziewa si,
      When was stolen the only Monet in Poland no one expected oneself,
      gdzie si   po latach odnajdzie.
      where it oneself after years will be found
      "When the only Monet's painting in Poland was stolen, no one expected,
      where it will be found years later."[5]

Another objection that can potentially be raised against my method of investigation is that it is visible in the results that the further into the survey, the less unanimous the participants are. The answer to the first question is (almost) unanimous, and we can observe a major disagreement in answers to the last questions. One may argue that this is because people lose their "natural" intuitions in the process since they have to analyse many sentences and start to "overthink". I agree that separating the study into as small as possible sub-studies would be better to get the best results. However, the length of the study (10 minutes) is not overwhelming, so it could not cause a major issue.

However, it is essential to observe that the disagreement level gets stronger and stronger throughout the survey. I would argue that as the statements' complexity increases, the participants' intuitions become less clear. Firstly they are asked to analyse a simple sentence of the form $\ulcorner sVd \urcorner$, then negation comes into play ($\ulcorner s\neg Vd \urcorner$), and afterwards, an embedded interrogative ($\ulcorner s\neg Vq \urcorner$). I don't think that the "tiredness" or "overthinking" of the participants play a role here, but rather the fact that they are asked to analyse very complex and not entirely natural sentences. This is indeed an issue, but the consultants of the MECORE project face the same one. If we want to get results concerning complex sentences and inferences, we need to investigate them.

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[5]https://kultura.onet.pl/sztuka/polski-prawie-lupin-kradziez-dekady-z-milosci/ldt8g9c [access: 03.04.2022]

Explanation of the survey's result with respect to interrogative complements.

The first unexpected result of the survey is that the participants disagree on whether or not the sentence of the form Q is true in the given context. The part of the story that is relevant to that sentence is that the proposition that the subject "expects" to be true is false, since this is the only contextual reason why people would reject Q as false if they accept P as true. Therefore at least some participants think that "spodziewa si" is non-veridical and at the same time Q-to-P veridical and thus (as mentioned above) not P-to-Q distributive. Assuming that semantic properties behave as defined in the methodology of the MECORE project and that the design of the survey is unproblematic, there seem to be only two possible linguistic explanations for the unexpected behaviour of the predicate "spodziewa si":

1. The predicate "spodziewa si" is used differently accros the population. Some of the participants use it as Q-to-P veridical and thus claim that Q is false.

2. The predicate "spodziewa si" is ambiguous between two readings. Some of the participants used the Q-to-P veridical reading and thus claim that Q is false.

Observe that independently of which explanation is true, the predicate "spodziewa si" is a counterexample to the $\mathbb{QP}$ hypothesis. If there is a variation in the population, we can still distinguish a sub-language or dialect of Polish in which the predicate "spodziewa si" is not P-to-Q distributive. If ambiguity is involved, in at least one sense, the predicate "spodziewa si" is not P-to-Q distributive. However, it still confirms my $\mathbb{E}$ hypothesis as it is still Q-to-P distributive in all the senses and throughout the population. The ambiguity explanation seems less probable, as there is no syntactic way of disambiguating between the two meanings of the predicate "spodziewa si" however, a more detailed study should be performed to verify whether one of these explanations is true.

Another possible way of explaining the problematic behaviour of the "spodziwa si" predicate is to claim that the assumptions of the MECORE project are not entirely correct. The semantic properties of the clause-embedding predicates may be strongly

context-dependent, or they may also not be binary but constitute a continuum of satisfaction levels.[6] As mentioned in Section 3.2.4 the semantics of the Polish predicate "aowa" (*eng:* "to regret") leads to similar conclusions with respect to the property of veridicality. It is impossible to conclude, based on just one study of one or two predicates in one language that the assumptions of the project are wrong. However, the survey results indicate that a more experimental study of other predicates should be performed to investigate the semantics of the clause-embedding predicates in general properly and ensure that the method of the MECORE project is sound.

Relatedly, the difference in usage of a predicate may be connected to the issues with the complexity of some contexts. As mentioned above, if a predicate is used under negation and embeds an interrogative, it can be difficult to process for a study participant. However, this difficulty occurs not only in the experimental setup but also in real life. A predicate may be used in different ways in complex contexts because there is no established, only "correct" way to use it, and it is not trivial to deduce it from the "default" meaning of a predicate. Moreover, if a predicate is not used frequently in a particular complex syntactical context then the plausibility of this hypothesis increases, as native speakers of the language do not have many occasions to establish a way of using it naturally.

The survey results provide another interesting phenomenon, i.e., half of the participants (48/96) accepted both Q and $\neg Q$ as true in one context, i.e. claim that (17) and (18) can both true in the same context. At first glance, this answer pattern seems to be contradictory, as it implies that a conjunction $\ulcorner sVq \urcorner \wedge \ulcorner s\neg Vq \urcorner$ is true, which seems to be a contradiction. It would be a contradiction if $\ulcorner s\neg Vq \urcorner \Rightarrow \neg \ulcorner sVq \urcorner$ so if (18) implies (19). Therefore the study indicates that the latter implication does not hold for the predicate spodziewa si. This fact suggests that negation can introduce a change of the meaning more significant than we expect, which can, in principle, be non-compositional.

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[6]In a personal conversation, the members of the MECORE project brought to my attention that similar behaviour was observed in other languages. To adress this issue, at least to some extent, the current version of the questionnaire asks, in many cases, not just whether a certain predicate satisfies a certain property, but also makes a distinction between "typically" and "always", eliciting further comments when people choose "typically". In my opinion this is a step in a right direction.

(17)   Anna spodziewa si,   kto wygra C.
            Anna expects   oneself who won C.
            "Anna expects who won C".

(18)   Anna **nie**   spodziewa si,   kto wygra C.
            Anna NEG expects   oneself who won C.
            "Anna does not expects who won C".

(19)   **Nie** jest tak, e   Anna spodziewa si,   kto wygra C.
            NEG is   like, that Anna expects   oneself who won C.
            "It is not the case that Anna expects who won C".

The fact that predicates under negation behave differently is not surprising. First of all, many predicates in the database are projective under negation, even though they are neither veridical nor anti-veridical (e.g. "martwi si" - be worried, "poinformowa"-inform or "wyjani"-explain). Moreover, as Mayr (2019) observes, some predicates differ in selectional properties when embedded under negation (see (20-a) and (20-b)).[7] It is interesting to notice that this prediction is not true if the negation takes a wider scope as in (20-c) rather than only negates the predicate as in (20-b). This behaviour also suggests that $\ulcorner s \neg V q \urcorner$ may not be equivalent to $\neg \ulcorner s V q \urcorner$ for every predicate V, as indicated above.

(20)   a. *Ann is certain whether Mary won the race.
        b.   Ann is **not** certain whether Mary won the race.
        c. ??It is **not** the case that Ann is certain whether Mary won the race .

Therefore the study of the clause-embedding predicates is even more complicated than expected. In Section 1.2, I already indicated that a predicate might differ in selectional properties in different syntactic contexts. In this section, I indicated that the meaning of a predicate in a syntactic context might not be compositionally derivable from the "default" meaning of a predicate.

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[7]This observation was empirically confirmed by van Gessel et al. (2018).

Chapter 5

Conclusion

The main objective of this thesis project was to create a database of clause-embedding predicates using the methodology of the MECORE project by Uegaki et al. (2022). Appendix A presents the database; it contains 1728 data points analysing 48 Polish clause-embedding predicates with respect to 23 semantic and 13 selectional properties. I provide a piece of linguistic data for each data point that explains and confirms it in Appendix B. This database, as contribution to the MECORE project, can be used by other scientists who work on clause-embedding predicates. I described the process of creation of this database in Chapter 2. In Section 2.4 I discussed some critical remarks on the technical part of the method of the MECORE questionnaire.

To create the database, I had to translate the tests provided in the MECORE questionnaire, and since the translation is not always trivial, I had to find a systematic way to do it. In Section 1.3.1, I presented a mode of formal representation that allows for a systematic formal representation of the semantic properties. I argued that a proper formal system with syntax and semantics should be introduced to the project to ensure methodological soundness. The presented mode of representation requires refinements but is a first step toward a general formal framework of the semantic properties.

In Section 1.2, I provided a detailed theoretical discussion of the semantics of the clause-embedding predicates to motivate this data collection process. The focus of this analysis lies on two puzzles investigated in the recent state-of-the-art literature on

this topic. Firstly, I discussed the responsiveness puzzle, which aims to explain, from the formal semantics point of view, how (responsive) predicates can embed declarative and interrogative clauses without a type clash. I offered some arguments in favour of the "Uniformity solution", which claims that declaratives and interrogatives are expressions of the same type.

The second puzzle, which is the main focus of my discussion, concerns the characterisation of the three classes of clause-embedding predicates: responsive, rogative and anti-rogative, in terms of their semantic properties. In Section 1.4 I presented the most prominent constraints that were postulated in the literature as (partial) solutions to this puzzle. Since these constraints describe a relation between a group of predicates that satisfy some property(ies) and another group that satisfies different property(ies), I could check them against the database and see whether they hold in Polish. In Chapter 3, I present the results of this procedure.

The *veridicality hypothesis* ($\mathbb{V}_2$) proposed by Egré (2008), which claims that all veridical predicates are responsive, turned out to be false. However, the only counterexample - "aowa" (*eng:* "to regret") is controversial since it is unclear whether it is indeed veridical. In Section 3.2.4, I discuss this predicate in more depth and indicate that its veridicality should be empirically and cross-linguistically verified. Moreover, the property of veridicality should be investigated further in light of this predicate, as it may not be binary, but gradable. This phenomenon goes against one of the main assumptions of the MECORE project, i.e. that each clause-embedding predicate either satisfies or does not satisfy each property which can be applied to it.

The *universality with respect to veridicality* hypothesis ($\mathbb{UV}$), proposed by Spector and Egré (2015), which claims that a predicate is veridical if and only if it is Q-to-P veridical, also turned out to be false. Its right to left direction is violated by the predicate "dba" (*eng:* "to care"), which was already discussed by Uegaki (2019) and the left to right direction that has not been criticised yet in the literature is violated by predicates "dowiedzie si" and "wyjani" (*eng:* "to learn" and "to explain"). I discuss these verbs, in Section 3.2.1 and Section 3.2.2 respectively.

The *neg-raising* hypothesis ($\mathbb{NR}$) presented by Theiler et al. (2019), which claims that any neg-raising predicate is anti-rogative was confirmed by the database. Af-

ter performing the test provided in the questionnaire it seemed that the predicate "spodziewa si" (*eng:* "to expect") is neg-raising but can embed interrogative complements. However, a closer investigation and the empirical study described in Chapter 4 indicated that this predicate is non-neg-raising, but just very context-sensitive with respect to this property.

The *preferentiality hypothesis* ($\mathbb{NVP}$) presented by Uegaki and Sudo (2019), which claims that any preferential not-veridical predicate is also anti-rogative turned out to be false. The study indicated that the predicates: "martwi si", "ba si" i "narzeka" (*eng*: "be worried", "fear" and "complain" respectively). are counterexamples to this hypothesis. However, as I argued in Section 3.2.3, these predicates do not satisfy the *Threshold Significance* pressuposition that Uegaki and Sudo (2019) used to derrive anti-rogativity. Therefore, the semantic derrivation is correct, but its assumption is not satisfied by all preferential predicates. As a refinement of this idea I proposed an original hypothesis:

$\mathbb{NVPP}$: *If a predicate is non-veridical and* positively *preferential then it is also anti-rogative.*

In Section 3.1.3, I observed that *Threshold Significance* presupposition is satisfied by all positive preferential preference. Thus the hypothesis $\mathbb{NVPP}$ is formally justified by the derivation in the paper by Uegaki and Sudo (2019) and independently confirmed by the data collected in my database.

The *c-distributivity* hypothesis ($\mathbb{CD}$), proposed by Theiler et al. (2018) claims that all responsive predicates are Q-to-P and P-to-Q distributive. Its first conjunct is violated by the predicate "dba" (*eng:* "to care"). Already Roelofsen and Uegaki (2021) indicate that this conjunct is problematic and proposed to weaken it to only P-to-Q distributivity:

The *P-to-Q entailment* hypothesis ($\mathbb{QP}$) proposed by Roelofsen and Uegaki (2021), which claims that all predicates are P-to-Q veridical turned out to be false. It is falsified by the predicate "dowiedzie si" (*eng:* "to learn") and potentially also by the predicate "wyjani" (*eng:* "to explain") as discussed in Section 3.2.2. After performing the test provided in the questionnaire it seemed that the predicate "spodziewa

si" (*eng:* "to expect") is not P-to-Q distributive. However, the empirical study described in Chapter 4 indicated that its behavior with respect to this property is more complicated.

As I argue in Section 3.2.1, the English predicate "to learn" falsifies the $\mathbb{QP}$ hypothesis as well. This result is surprising, as this hypothesis was not falsified in any previous work. Therefore, in Section 3.1.5, I present an original *Entailment hypothesis* ($\mathbb{E}$) that is a refinement of the $\mathbb{QP}$ hypothesis:

$\mathbb{E}$: *(Entailment hypothesis) All responsive predicates are either Q-to-P or P-to-Q distributive.*

I called this hypothesis the *entailment hypothesis*, since it can be equivalently formulated as a claim that "interrogative and declarative complements of a predicate are always *related by entailment*" This hypothesis is confirmed by my database, as there is no predicate that would be neither Q-to-P nor P-to-Q distributive. Moreover, it is independently motivated by Spector and Egré (2015) intuition, who claim that it is implausible that there exists a predicate which would have a different meaning while embedding declaratives and a different one for interrogatives. My hypothesis follows this intuition but makes a claim weaker then the disproved $\mathbb{UV}$ hypothesis proposed by Spector and Egré (2015).

Thus, as an original theoretical contribution to the study of clause-embedding predicates, I provided the $\mathbb{NVPP}$ hypothesis, which refines the conclusions of Uegaki and Sudo (2019) and the $\mathbb{E}$ hypothesis which refines the propositions by Theiler et al. (2018) and Roelofsen and Uegaki (2021) as well as the line of research on veridicality discussed by Spector and Egré (2015).

The analysis of the database indicated that the verbs "spodziewa si", "dowiedzie si", "aowa", and "wyjani" (*eng:* "to expect", "to learn", "to regret", "to explain") are particularly interesting and difficult to evaluate and that they are worth a proper theoretical and empirical study. In Section 3.2, I indicated why these verbs need to be studied further and provided a theoretical analysis of their relevant properties.

To properly investigate the properties of the predicate "spodziewa si", I decided to perform an empirical study, which I discussed in Chapter 4. This investigation

indicated study of the clause-embedding predicates is more complicated than expected. The tests of semantic properties, especially those that involve interrogative complements, are difficult to evaluate even for native speakers. The empirical study indicates that the semantic properties of the clause-embedding predicates may be strongly context-dependent, or they may also not be binary but constitute a continuum of satisfaction levels. As mentioned in Section 3.2.4, the analysis of the semantics of the Polish predicate "aowa" (*eng:* "to regret") leads to a similar conclusion. The results of this study clearly show that in future research, more experiments should be performed to properly investigate the semantics of the clause-embedding predicates to confirm researchers' linguistic intuitions and ensure the soundness of the method of investigation.

Appendix A

Database of selected clause-embedding predicates in Polish

For an easier to read version of this spreadsheet please consult the attached files or follow the following link: `https://docs.google.com/spreadsheets/d/1qijQda` `k7ppgDqFB91iY-O03P3MV-21Wq/edit?usp=sharing&ouid=11712731162858072901` `1&rtpof=true&sd=true`

predicate	English translation	predicate class	veridicality/anti-veridicality wrt declaratives	conjoined with negation of the comp	conjoined with the complement	Complement projection/reversion through negation	neg-raising	Likelihood: Likelihood	Likelihood: d	Likelihood: likelihood	Certainty: Certainty	Certainty: Counter-certainty	Certainty: Uncertainty	Preferentiality: Preference	Preferentiality: Opposition	Preferentiality: e	focus sensitivity wrt decl	gradability wrt decl	ignorance/belief wrt int	gradability wrt int	Q-to-P veridicality	Q-to-P distributivity	P-to-Q distributivity	Intransitive use
akceptować	accept	assessment	veridical	contradictory	redundant	always projective	0	always	incompatibile	incompatible	always	incompatible	incompatible	compatible	compatible	compatible	1	0	belief	0	1	1	1	0
zaprzeczać	deny	assessment	neither	neither	neither	neither	0	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	0	0	N/A	N/A	N/A	N/A	N/A	
mieć nadzieję	hope	bouletic	neither	neither	neither	neither	0*	compatible	compatible	compatible	incompatible	incompatible	always	incompatible	incompatible	incompatible	1	0	N/A	N/A	N/A	N/A	N/A	
modlić się	pray	bouletic	neither	neither	neither	neither	0	compatible	typically	compatible	incompatible	incompatible	always	always	incompatible	incompatible	1	0*	N/A	N/A	N/A	N/A		1
woleć	prefer	bouletic	neither	neither	neither	N/A	N/A but m	compatible	compatible	compatible	incompatible	incompatible	always	always	incompatible	incompatible	1	0	N/A	N/A	N/A	N/A	N/A	0
chcieć	want	bouletic	neither	neither	neither	neither	1	compatible	compatible	compatible	compatible	incompatible	typically	always	incompatible	incompatible	1	1	N/A	N/A	N/A	N/A	N/A	0
martwić się	be worried	negative	neither	neither	neither	always projective	0	always	incompatible	incompatible	always	incompatible	incompatible	incompatible	always	incompatible	1	1	typically ignorance	1	0*	0*	1	1
bać się	fear	negative	neither	neither	neither	neither	0	compatible	compatible	compatible	incompatible	incompatible	always	incompatible	always	incompatible	1	1	ignorance	1	0	0	1	1
oznajmiać	announce	communication	neither	neither	neither	neither	0	compatibile	compatible	compatible	compatibile	compatible	compatibile	compatible	compatibile	compatibile	0	0	neither	0	0	1	1	0
spierać się	argue	communication	neither	neither	neither	neither	0	typically implies	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	1	0	neither	0	0	1	1	1*
zapewnić	assert	communication	neither	neither	neither	neither	0	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	0	0	N/A	N/A	N/A	N/A	N/A	
twierdzić	claim	communication	neither	neither	neither	neither	0	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	0	0	N/A	N/A	N/A	N/A		0
skarżyć się	complain	communication	neither	neither	neither	always projective	0	always	incompatible	incompatible	always	incompatible	incompatible	incompatible	always	incompatible	1	1	N/A	N/A	N/A	N/A	N/A	1
narzekać *	complain	communication	neither	neither	neither	always projective	0	always	incompatible	incompatible	always	incompatible	incompatible	incompatible	always	incompatible	1	1	always belief*	1*	1*	1*	1*	1
wyjaśniać	explain	communication	neither	neither	neither	always projective	0	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	1	0	belief	0	1*	1*	0*	0
informować	inform	communication	neither	neither	neither	always projective	0	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	1	0	neither	0	0	1	1	0
powiedzieć	tell	communication	neither	neither	neither	always projective	0	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	0	0	neither	0	0	1	1	0
wyszeptać	whisper	communication: manner of	neither	neither	neither	neither	0	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	0	0	neither	0	0	1	1	0*
napisać	write	communication: manner of	neither	neither	neither	neither	0	compatible	compatible	compatible	compatible	typically incompatible	compatible	compatible	compatible	compatible	0	0	neither	0	0	1	1	0*
zdecydować	decide	decision	typically	neither	typically redundant	neither	0	typically implies	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	1	0	typically belief	0	typically 1	1	1	0
rządać	demand	directive	neither	neither	neither	neither	0	typically implies	compatible	compatible	incompatible	incompatible	always	typically implies	compatible	compatible	1	0	N/A	N/A	N/A	N/A	N/A	0
rozkazywać	order	directive	typically	neither	typically redundant	neither	0	typically implies	compatible	compatible	incompatible	incompatible	always	compatible	compatible	compatible	1	0	N/A	N/A	N/A	N/A	N/A	0
proponować	propose	directive	neither	neither	neither	neither	0	compatible	compatible	compatible	incompatible	incompatible	always	typically implies	compatible	compatible	1	0	N/A	N/A	N/A	N/A	N/A	0
ktoś	agree	doxastic	neither	neither	neither	neither	d	implies	compatible	compatible	compatible	incompatible	compatible	compatible	compatible	compatible	0	0	N/A	N/A	N/A	N/A	N/A	0
założyć	assume	doxastic	neither	neither	neither	neither	0	compatible	compatible	compatible	incompatible	compatible	typically imples	compatible	compatible	compatible	1	0	N/A	N/A	N/A	N/A	N/A	0
być pewnym	be certain	doxastic	neither	neither	neither	neither	0	always	incompatible	incompatible	always	incomatible	incompatible	compatible	compatible	compatible	0	0	N/A	N/A	N/A	N/A	N/A	0
być przekonanym	convinced	doxastic	neither	neither	neither	neither	0	always	incompatible	incompatible	always	incompatible	incompatible	compatible	compatible	compatible	0	0	N/A	N/A	N/A	N/A		0
być nieświadomym	be unaware	doxastic	veridical	contradictory	redundant	projective *	0*	incompatible	compatible	compatible	incompatible	compatible	compatible	compatible	compatible	compatible	1	0	ignorance	0	1	1	1	0
wierzyć	believe	doxastic	neither	neither	neither	neither	1	implies	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	0	1*	N/A	N/A	N/A	N/A		0
spodziewać się	expect	doxastic	neither	neither	neither	typically projective	0*	always	incompatible	incompatible	compatible	incompatible	compatible	compatible	compatible	compatible	0	0	belief	0	typically 1	1	typically 1*	0
wiedzieć	know	doxastic	veridical	contradictory	redundant	projective *	0	always	incompatible	incompatible	always	incompatible	incompatible	compatible	compatible	compatible	0	0	belief	0	1	1	1	0
podejrzewać	suspect	doxastic	neither	neither	neither	neither	0	always	incompatible	incompatible	incompatible	incompatible	always	compatible	compatible	compatible	1	0	belief*	0	0	1	1	0
myśleć	think	doxastic	neither	neither	neither	neither	1	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	compatible	0	0	N/A	N/A	N/A	N/A		1
mieć rację	be right	doxastic evaluative	veridical	contradictory	redundant	reversal	undecided	always	incompatible	incompatible	compatible	incompatible	compatible	compatible	compatible	compatible	0	0*	belief	0	1	1	1	0
mylić się	be wrong	doxastic evaluative	anti-veridical	redundant	contradictory	projective	undecided	always	incompatible	incompatible	compatible	incompatible	compatible	compatible	compatible	compatible	1	1*	belief	1*	1	1	1	0
zapomnieć	forget	doxastic: change of state	veridical	contradictory	redundant	projective	0	incompatible	compatible	compatible	incompatible	compatible	compatible	compatible	compatible	compatible	1	0	neither	0	1	1	1	0
dowiedzieć się	learn	doxastic: change of state	neither	neither	neither	neither	0	typically implies	compatible	compatible	compatible	typically incompatible	compatible	compatible	compatible	compatible	1	0	belief	0	1	1	0	0
wątpić	doubt	dubitative	neither	neither	neither	neither	0	incompatible	always	incompatible	compatible	compatible	implies	compatible	compatible	compatible	1	0	N/A*	N/A	N/A	N/A	N/A	0*
być zadowolonym	be happy	emotive factive	veridical	contradictory	redundant	projective	0	always	incompatible	incompatible	always	incompatible	incompatible	always	e	e	1	1	belief	1	1	1	1	1
być zaskoczonym	be surprised	emotive factive	veridical	contradictory	redundant	projective	0	always	incompatible	incompatible	always	incompatible	incompatible	always	e	e	1	1	belief	1	1	1	1	1
żałować	regret	emotive factive	veridical	contradictory	redundant	projective	0	always	incompatible	incompatible	always	incompatible	incompatible	incompatible	always	e	1	1	N/A	N/A	N/A	N/A	N/A	
pytać	ask	inquisitive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	neither	0	N/A	N/A	N/A	0
być ciekawym	be curious	inquisitive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ignorance	1	N/A	N/A	N/A	0*
dociekać	inquire	inquisitive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ignorance	0	N/A	N/A	N/A	0
badać	investigate	inquisitive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ignorance	0	N/A	N/A	N/A	0
zastanawiać się	wonder	inquisitive	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	ignorance	0*	N/A	N/A	N/A	1
widzieć	see	perception	veridical	contradictory	redundant	projective	0	implies	compatible	compatible	compatible	incompatible	compatible	compatible	compatible	compatible	0	0	neither	0	1	1	1	0
obchodzić	care	predicates of relevance	veridical	contradictory	redundant	projective	0	always	incompatible	incompatible	always	incompatible	incompatible	compatible	compatible	incompatibile	1	1	neither	1	0	0	1	0
udowodnić	prove	ratification	veridical	contradictory	redundant	neither	0	implies	compatible	compatible	implies	incompatible	compatible	compatible	compatible	compatible	1	0	belief	0	1	1	1	0

predicate	English translation	finite indicative declarative clause	finite subjunctive declarative clause	Finite d-linked constituent interrogative clause:	finite non-d-linked constituent interrogative clause	finite polar interrogative clause	finite alternative interrogative clause	non-d-linked constituent interrogative clause with main clause syntax	non-finite declarative clause without subject	non-finite d-linked constituent interrogative without subj	non-finite non-d-linked constituent interrogative without subj	non-finite polar int without subj	non-finite alt int without subj	concealed q
akceptować	accept	1	1	1	1	0	0	1	0	0	0	0	0	1
zaprzeczać	deny	1	0	0	0*	0	0	0	0	0	0	0	0	0
mieć nadzieję	hope	1	0	0	0	0	0	0	1	0	0	0	0	0
modlić się	*pray*	1*	1	0	0	0	0	0	0	0	0	0	0	0
woleć	*prefer*	0	1	0	0	0	0	0*	1	0	0	0	0	0*
chcieć	*want*	0	1	0	0	0	0	0	1	0	0	0	0	0
martwić się	*be worried*	1	0	1	1	1	1	1	0	1*	1*	1*	1*	1
bać się	*fear*	1	0*	1	1	1	1	0	1	0	0	0	0	0
oznajmiać	*announce*	1	0	1	1	1	1	0	0*	0*	0*	0*	0*	0
spierać się	*argue*	1	0	1	1	1	1	1	0	1	1	1	1	1*
zapewnić	*assert*	1	0	0	0	0	0	0	0	0	0	0	0	0
twierdzić	*claim*	1	0	0	0	0	0	0	0	0	0	0	0	0
skarżyć się	*complain*	1	0	0	0	0	0	0	0	0	0	0	0	1*
narzekać *	*complain*	1	0	1*	1*	0	0	1*	0	0	0	0	0	1*
wyjaśniać	explain	1	0*	1	1	1	1	1	0*	0*	0*	0*	0*	0
informować	*inform*	1	0	1	1	1	1	1	0*	0*	0*	0*	0*	1*
powiedzieć	*tell*	1	1	1	1	1	1	1	0	1	1	1	1	1
wyszeptać	*whisper*	1	1	1	1	1	1	1	0	1	1	1	1	1
napisać	*write*	1	1	1	1	1	1	1	0	1	1	1	1	1
zdecydować	*decide*	1	1	1	1	1*	1*	1	0*	1	1	1	1	1*
rządać	*demand*	0	1	0	0	0	0	0	0	0	0	0	0	0
rozkazywać	*order*	1*	1	0	0	0	0	0	1	0	0	0	0	0
proponować	*propose*	1*	1	0	0	0	0	0	1	0	0	0	0	1
zgadzać się	*agree*	1	1	0*	0*	0*	0*	0*	1	0	0	0	0	0
założyć	*assume*	1	0	0	0	0	0	0	0	0	0	0	0	0
być pewnym	*be certain*	1	0	0	0	0	0	0	0	0	0	0	0	0
być przekonanym	*convinced*	1	0	0	0	0	0	0	0	0*	0*	0*	0*	0
nieświadomym	*be unaware*	1	0	1	1	0	0	1	0	0	0	0	0	1
wierzyć	*believe*	1	0	0	0	0	0	0	0	0	0	0	0	0
spodziewać się	*expect*	1	0	1	1	0	0	0	0	0	0	0	0	0
wiedzieć	*know*	1	0	1	1	1	1	1	0	1	1	1	1	0*
podejrzewać	*suspect*	1	0	1	1	0	0	0	0	0	0	0	0	0
myśleć	*think*	1	0	0*	0*	0*	0*	0*	0	0*	0*	0*	0*	0
mieć rację	*be right*	1	1	1	1*	1*	1*	1*	0	0	0	0	0	0
mylić się	*be wrong*	1	0	1	1*	1*	1*	1*	0	0	0	0	0	0
zapomninać	*forget*	1	0	1	1	1	1	1	1	0	0	0	0	1*
dowiedzieć się	*learn*	1	0	1	1	1	1	1	0	0	0	0	0	0
wątpić	*doubt*	1	1	0	0	1*	0	0	0	0	0	0	0	0
zadowolonym	*be happy*	1	0	1*	1*	0	0*	0	0	0	0	0	0	1*
być zaskoczonym	*be surprised*	1	0	1	1*	0	0	1	0	0	0	0	0	0
żałować	*regret*	1	0	0	0	0	0	0	0	0	0	0	0	0
pytać	*ask*	0	0	1	1	1	1	1	0	1	1	1	0	1
być ciekawym	*be curious*	0	0	1	1	1	1	1	0	0	0	0	0	1
dociekać	*inquire*	0	0	1	1	1	1	1	0	1	1	1	0	1*
badać	*investigate*	0	0	1	1	1	1	1	0	1	1	1	0	0
zastanawiać się	*wonder*	0	0	1	1	1	1	1	0	1	1	1	0	0
widzieć	*see*	1	0	1	1	1	0*	0	0	0	0	0	0	1
obchodzić	*care*	1	0	1	1*	1	1	1	0	0*	0*	0*	0*	1*
udowodnić	*prove*	1	0	1	1	1	1	0	0	0	0	0	0	0

Appendix B

The linguistic data from Polish

The document with the linguiscitic data is too long to fit it into an appendix of a thesis. Below I present one section of it, to allow the reader to understand how the document looks like. To see the entire data set please find the document in the attachment or consult the following link: `https://drive.google.com/file/d/1V` `izpPfs4vuiqdbkUm8axNpK97wVomM2i/view?usp=sharing`

Wiedzie - *to know*

Please note that the English verb "to know" can be translated to Polish as either "wiedzie" (fr: *savoir*, de: *wissen*) which takes propositional complements and means "to poses knowledge about something" or as *zna* (fr: *connaître*, de: *kennen*) which takes DP complaments and means "to be aquainted with something".

B.1   Semantic properties

Veridicality/anti-veridicality w.r.t. declaratives

The verb "wiedzie" is veridical with respect to declaratives as (1) implies that it is raining.

(1)   Anna wie,   e   pada.
        Ann   knows, that it is raining.
        "Ann knows that it is raining."

Conjoined with negation of the complement

Sentences containing the verb "wiedzie" cannot be conjoined with the negation of the complement as (2) sounds contradictory.

(2)   Anna wie,   e   pada,   ale tak   naprawd nie   pada.
        Ann   knows, that it is raining but (like) in fact   NEG it is raining.
        "Ann knows that it is raining, but in fact it is not raining."

Conjoined with the complement

Sentences containing the verb "wiedzie" sounds redundant when conjoined with the complement as in (3).

(3)   Anna wie,   e   pada,   i   naprawd pada.
        Ann   knows, that it is raining and in fact   it is raining.
        "Ann knows that it is raining, but in fact it is raining."

Complement projection/reversal through negation

The verb "wiedzie" is projective through negation as (4) is a valid inference.

(4)   Anna nie   wie,   e   pada.
        Ann   NEG knows, that it is raining.
        "Ann doesnt know that it is raining. "

⇝   Pada.
        it is raining
        " It is raining "

Neg-raising

The verb "wiedzie" is not neg-raising as (5) is not a valid inference.

(5) Anna nie   wie,   e   pada.
     Ann   NEG know, that it is raining.
     "Ann doesnt know that it is raining. "

↛   Anna wie,   e   nie   pada.
     Ann knows that NEG it is raining.
     " Ann knows that it is not raining."

Likelihood implications w.r.t. declaratives

The verb "wiedzie" has a likelihood implication as (6) is compatible only with this scenario.

(6) Anna wie,   e   pada.
     Ann   knows, that it is raining.
     "Ann knows that it is raining. "

✓   Anna uwaa,   e   jest bardziej prawdopodobne to, e   pada,   ni
     Ann considers that it is more   probable   it   that is raining then
     to, e   nie   pada.
     it that NEG is raining.
     " Ann considers it more likely that it is raining than that it is not raining. "

✗   Anna uwaa,   e   jest mniej prawdopodobne to, e   pada,   ni   to,
     Ann considers that it is less   probable   it   that is raining then that
     e nie   pada.
     it NEG is raining.
     " Ann considers it less likely that it is raining than that it is not raining. "

✗   Anna uwaa,   e   jest równie prawdopodobne to, e   pada,   jak to,
     Ann considers that it is equally probable   it   that is raining then it
     e   nie   pada.
     that NEG is raining.

" Ann considers the possibility that it is raining and the possibility that it is not raining equally likely."

Certainty implications w.r.t. declaratives

The verb "wiedzie" has a certainty implication as (7) is compatible only with this scenario.

(7)   Anna wie,   e   pada.
          Ann   knows, that it is raining.
          "Ann knows that it is raining. "

✓   Anna jest pewna, e   pada.
          Ann   is   certain that it is raining
          " Ann is certain that it is raining "

×   Anna jest pewna, e   nie   pada.
          Ann   is   certain that NEG it is raining.
          "Ann is certain that it is not raining. "

×   Anna nie   jest pewna czy   pada   czy nie.
          Ann   NEG is   certain whether it is raining or   not.
          " Ann is uncertain whether it is raining or not."

Preferentiality implications w.r.t. declaratives

The verb "wiedzie" has no preferentiality implications as (8) is compatible with all the scenarios.

(8)   Anna wie,   e   pada.
          Ann   knows, that it is raining.
          "Ann knows that it is raining. "

✓   Anna woli,   eby   padao,   ni eby   nie   padao
          Ann   prefers that would it was raining over that would NEG it was raining

" Ann prefers the possibility that it is raining over the possibility that it is
not raining. "

✓   Anna woli, eby   nie padao   ni eby   padao.
       Ann   prefers that would NEG it was raining over that would it was raining
       " Ann prefers the possibility that it is not raining over the possibility that it
       is raining. "

✓   Anna jest obojtna   czy   pada,   czy nie.
       Ann is   indifferent whether it is raining or not.
       " Ann is indifferent as to whether it is raining or not"

Focus sensitivity

The verb "wiedzie" is not focus sensitive as (9) is a valid inference since its premise
under *de dicto* reading is incompatible with Anna not knowing who will teach syntax.

(9)   Anna wie,   e   Piotr bdzie uczy syntaktyki we WTOREK.
       Ann knows, that Peter will   teach syntax   on TUESDAY.
       "Ann knows that Peter will teach syntax on TUESDAY. "

⤳   Anna wie,   e   Piotr bdzie uczy syntaktyki.
       Ann knows, that Peter will   teach syntax.
       " Ann knows that Peter will teach syntax."

Gradability w.r.t. declaratives

The verb "wiedzie" is non gradable with respect to declaratives as (10), (11) and (12)
are not well formed sentences.

(10)   *Anna bardzo wie,   e   pada.
       Ann   very   knows, that it is raining.
       " Ann knows very much that it is raining. "

(11) *Anna wie, e pada, bardziej(mocniej) ni Piotr.
      Ann knows, that it is raining more   than Peter.
      " Ann knows that it is raining more than Peter does. "

(12) *Anna wie e pada, bardziej ni, e jest zimno.
      Ann knows, that it is raining more than that it is cold.
      " Ann knows that it is raining more than that it is cold."

Belief/ignorance w.r.t. interrogatives

The verb "wiedzie" is beleif entailing with respect to interrogatives as (13) implies that Ann has a belief that is an answer to the question "which player won the race".

(13) Anna wie, która zawodniczka wygraa wycig.
      Ann knows which player   won the race.
      "Ann knows which player won the race."

Gradability w.r.t. interrogatives

The verb "wiedzie" is non gradable with respect to interrogatives as (14), (15) and (16) are not well formed sentences.

(14) *Anna bardzo wie, kto wyszed.
      Ann very knows, who left.
      "Ann knows very much who left. "

(15) *Anna wie kto wyszed bardziej(mocniej) ni Piotr.
      Ann knows who left more   than Peter.
      " Ann knows who left more than Peter does. "

(16) *Anna wie kto wyszed bardziej(mocniej) ni kto zosta.
      Ann knows who left more   than who stayed.
      " Ann knows who left more than who stayed."

Q-to-P veridicality

The verb "wiedzie" is Q-to-P veridical as (17) is a valid inference.

(17)   Piotr wie,   która zawodniczka wygraa wycig.   Maria wygraa ten
           Peter knows, which player   won   the race. Maria won   the
           wycig.
           race.
           "Peter knows which player won the race. Mary won the race. "

⤳   Piotr wie,   e   Maria wygraa wycig.
           Peter knows, that Maria won   the race.
           " Peter knows that Mary won the race."

Q-to-P Distributivity

The verb "wiedzie" is Q-to-P Distributive as (18) is a valid inference.

(18)   Piotr wie,   która zawodniczka wygraa wycig
           Peter knows, which player   won   the race.
           "Peter knows which player won the race. "

⤳   Piotr wie,   e x_F wygraa wycig.
           Peter knows, that x_F won   the race.
           " Peter knows that x_F won the race."

P-to-Q Distributivity

The verb "wiedzie" is P-to-Q Distributive as (19) is a valid inference.

(19)   Piotr wie,   e x_F wygraa wycig.
           Peter knows, that x_F won   the race.
           "Peter knows that x_F won the race. "

⤳   Piotr wie,   która zawodniczka wygraa wycig.
           Peter knows, which player   won   the race.
           " Peter knows which player won the race."

B.2   Selectional properties

✓Finite declarative clause in indicative mood

The verb "wiedzie" accepts finite declarative clauses in indicative mood, as (20) sounds well-formed.

(20)   Anna wie,   e   Maks czyta Wojn i   Pokój.
        Ann   knows that Max   read War and Peace.
        "Ann knows that Max read War and Peace."

✕Finite declarative clause in subjunctive mood

The verb "wiedzie" does not accept finite declarative clauses in subjunctive mood, as (21) sounds badly formed.

(21)   *Anna wie,   eby   Maks czyta Wojn i   Pokój.
        Ann   knows that would Max   read War and Peace.
        "Ann knows that Max read War and Peace."

✓Finite d-linked constituent interrogative clause

The verb "wiedzie" accepts finite d-linked constituent interrogative clauses, as (22) sounds well-formed.

(22)   Anna wie,   któr   ksik czyta Maks.
        Ann   knows which book Max   read.
        "Ann knows which book Max read."

✓Finite non-d-linked constituent interrogative clause

The verb "wiedzie" accepts finite non-d-linked constituent interrogative clauses, as (23) sounds well-formed.

(23) Anna wie, co   Maks czyta.
     Ann   knows what Max read.
     "Ann knows what Max read."

✓Finite polar interrogative clause

The verb "wiedzie" accepts finite polar interrogative clauses, as (24) sounds well-formed.

(24) Anna wie, czy   Maks czyta Wojn i   Pokój.
     Ann   knows whether Max read War and Peace.
     "Ann knows whether Max read War and Peace."

✓Finite alternative interrogative clause

The verb "wiedzie" accepts finite alternative interrogative clauses, as (25) sounds well-formed.

(25) Anna wie, czy   Maks czyta Wojn i   Pokój czy Ann Karenin.
     Ann   knows whether Max read War and Peace or Anna Karenina.
     "Ann knows whether Max read War and Peace or Anna Karenina."

✓Finite non-d-linked constituent interrogative clause with main clause syntax

The verb "wiedzie" accepts finite non-d-linked constituent interrogative clauses with main clauses syntax, as (26) sounds well-formed.

(26) Maks wie, co   powinien teraz zrobi.
     Max knows what should he now   do.
     "Max knows what should he do now."

✗Non-finite declarative clause without subject

The verb "wiedzie" does not accept non-finite declarative clauses without subject, as (27) sounds badly formed.

(27)   Anna wie   przeczyta Wojn i   Pokój.
             Ann knows to read   War and Peace.
             "Ann knows to read War and Peace."

✓Non-finite d-linked constituent interrogative clause without subject

The verb "wiedzie" accepts non-finite d-linked constituent interrogative clauses without subject, as (28) sounds well-formed.

(28)   Anna wie,   któr   ksik przeczyta.
             Ann   knows which book to read.
             "Ann knows which book to read."

✓Non-finite non-d-linked constituent interrogative clause without subject

The verb "wiedzie" accepts non-finite non-d-linked constituent interrogative clauses without subject, as (29) sounds well-formed.

(29)   Anna wie,   co   przeczyta.
             Ann   knows what to read.
             "Ann knows what to read."

✓Non-finite polar interrogative clause without subject

The verb "wiedzie" accepts non-finite polar interrogative clauses without subject, as (30) sounds well-formed.

(30)   Anna wie,   czy   przeczyta Wojn i   Pokój.
         Ann   knows whether to read   War   and Peace.
         "Ann knows whether to read War and Peace."

✓Non-finite alternative interrogative clause without subject

The verb "wiedzie" accepts non-finite alternative interrogative clauses without sub-
ject, as (31) sounds well-formed.

(31)   Anna wie,   czy   przeczyta Wojn i   Pokój czy Ann   Karenin
         Ann   knows whether to read   War   and Peace or   Anna Karenina.
         "Ann knows whether to read War and Peace or Anna Karenina."

?×Concealed question

The verb "wiedzie" does not accept concealed question, as (32) sounds badly formed.
However, the other translation of the English verb "to know" – "zna" accepts con-
cealed questions as in (33).

(32)   *Anna wie,   cen   mleka.
         Ann   knows the price of milk.
         "Ann knows the price of milk."

(33)   Anna zna,   cen   mleka.
         Ann   knows the price of milk.
         "Ann knows the price of milk."

×Intransitive use

The verb "wiedzie" does not have intransitive use, as (34) sounds infelicitous without
any context.

(34)   # Maks wie.
         Max   knows.
         "Max knows."

Appendix C

The complete survey on "spodziewa si"

In this appendix of the thesis, I will present the survey I used to investigate the semantic properties of the verb "spodziewa si". The first part presents all of the questions in Polish, and the second contains the English translation of the survey.

C.1 The complete survey in Polish

Introduction and legal information

Dzie dobry, Nazywam si Tomasz Klochowicz i jestem studentem drugiego roku studiów magisterskich na kierunku Logika na Uniwersytecie Amsterdamskim. Na pocztek chciabym Ci bardzo podzikowa za udzia w tej ankiecie. Wypenienie jej powinno Ci zaj okoo 10 minut. Ankieta skada si z 10 pyta na które nie ma poprawnych albo niepoprawnych odpowiedzi. Odpowiedz na nie zgodnie z tym co czujesz. Niektóre z pyta mog wyda Ci si bardzo podobne, prosz Ci jednak aby odpowiedzia/a na wszystkie pytania, gdy tylko pena odpowied moe zosta wykorzystana w badaniu. Ankieta nie sprawdza Twojej wiedzy na temat wiata. Niektóre z pyta odnosz si do prawdziwych postaci lub wydarze, ale historie w nich zawarte s wymylone na potrzeby

tej ankiety. Jeli która z historii wydaje Ci si nieprawdziwa lub nieprawdopodobna, spróbuj wyobrazi sobie opisywan przez ni sytuacj. Jeli masz jakiekolwiek pytania, napisz do mnie na adres mailowy t.j.klochowicz@uva.nl.

Informacja prawna: Odpowiadajc na pytania zawarte w niniejszej ankiecie, bierzesz udzia w badaniu bdcym czci projektu Cognitive Semantics and Quantities finansowanego przez European Research Council w ramach: European Union's Seventh Framework Programme (FP/2007-2013)/ERC Grant Agreement n. STG 716230 CoSaQ. Badanie jest przeprowadzane przez Tomasza Klochowicza pod nadzorem dr. Jakuba Szymanika oraz dr. Florisa Roelofsena w Institute for Logic, Language, and Computation, University of Amsterdam. Jeli masz jakiekolwiek pytania na temat tego badania skontaktuj si z Tomaszem Klochowiczem pod adresem e-mail: t.j.klochowicz@uva.nl. Aby wzi udzia w badaniu musisz mie ukoczone 18 lat. Udzia w badaniu jest cakowicie dobrowolny. Masz prawo odmówi odpowiedzi na którekolwiek z zadanych pyta. Masz prawo odmówi dalszego udziau w badaniu w dowolnym momencie i bez adnych konsekwencji. Masz zapewnion pen anonimowo; Osoby prowadzce badanie, które poprosiy Ci o wypenienie ankiety, nie otrzymaj dostpu do Twoich danych osobowych. Jeli chciaby/chciaaby zoy skarg lub zaalenie na sposób przeprowadzenia niniejszego badania moesz skontaktowa si z Ethics Committee of the Faculty of Humanities of the Univesity of Amsterdam pod adresem e-mail: commissie-ethiek-fgw@uva.nl; lub pod numerem telefonu: +31 20 525 3054; Kloveniersburgwal 48, 1012 CX Amsterdam.

Pytanie: Przeczytaem/am powysz informacj prawn i potwierdzam, e mój udzia w badaniu jest dobrowolnny. (Jedynie osoby, które zaakceptoway to stwierdzenie mogy wzi udzia w ankiecie.)

Pytanie: Jaka jest twoja znajomo jzyka Polskiego? (Jedynie osoby, które zadeklaroway, e s rodzimymi uytkownikami jyzka Polskiego, mogy wzi udzia w ankiecie.)

Veridicality

Przeczytaj ponisz histori:

Anna i Piotr od kilku lat s par. Wczoraj wieczorem Anna znalaza w kieszeni Piotra piercionek zarczynowy. Dzi Piotr zaprosi Ann na kolacj do wykwintnej restauracji. Anna szykuje si do wyjcia i myli: Piotr dzi mi si owiadczy. Niestety, Anna nie wie, e Piotr zakocha si w Barbarze i to jej chce si owiadczy, a Ann zaprosi na kolacj jedynie po to, eby zakoczy ich zwizek.

(1) Anna spodziewa si, e Piotr dzi si jej owiadczy.

Pytanie: Czy zdanie (1) jest prawdziwe w kontekcie tej historii?

Odpowiedzi: Tak; Nie; Nie mam zdania.

Projectivity under negation

Przeczytaj ponisz histori:

Marcin i Marzena od kilku lat s par. Dzi Marcin zaprosi Marzen na kolacj do wykwintnej restauracji. Marzena nie spodziewa si, e Marcin dzi si jej owiadczy.

(2) Marcin dzi owiadczy si Marzenie.

Pytanie 1: Czy zdanie (2) jest zawsze prawdziwe w tym kontekcie?

Odpowiedzi: Tak; Nie; Nie mam zdania.

Pytanie 2: Czy pogrubione zdanie ma sens jako kontynuacja tej historii? Oce w skali 1-5 gdzie 1 to "nie ma sensu" a 5 "jest cakowicie naturaln kontynuacj":

*Marcin i Marzena od kilku lat s par. Dzi Marcin zaprosi Marzen na kolacj do wykwintnej restauracji. Marzena nie spodziewa si, e Marcin dzi si jej owiadczy. **I susznie, bo Marcin nie ma tego w planach.***

Neg-raising

Testing the premise of the neg-raising inference:

Przeczytaj ponisz histori:

Celina od dawna nie widziaa swojej przyjacióki z dziecistwa - Barbary. M Celiny, Marcin, dowiedzia si e Barbara przebywa akurat w ich miecie wic, eby zrobi Celinie niespodziank, zaprosi Barbar na wspóln kolacj. Marcin i Barbara czekaj ju przy stole na Celin, która wanie wraca z pracy.

(3)   Celina nie spodziewa si, e Barbara bdzie dzi na kolacji.

Pytanie: Czy zdanie (3) jest prawdziwe w tym kontekcie?

Odpowiedzi: Tak; Nie; Nie mam zdania.

Testing the neg-raising inference:

Przeczytaj ponisz histori:

Joanna jest wielk fank Roberta Lewandowskiego. Jej znajomy, Piotr jest przyjacielem Roberta z dziecistwa, czego Joanna nie jest wiadoma. Aby zaimponowa Joannie, Piotr zaprosi Roberta na odbywajce si wieczorem przyjcie urodzinowe Joanny. Robert zaproszenie przyj i pojawi si na przyjciu jako niespodzianka dla Joanny.

(4)   Joanna spodziewa si, e Robert Lewandowski nie przyjdzie na przyjcie.

Pytanie 1: Czy zdanie (4) jest prawdziwe w tym kontekcie?

Odpowiedzi: Tak; Nie; Nie mam zdania.

Przeczytaj histori uzupenion o pogrubione zdanie:

Joanna jest wielk fank Roberta Lewandowskiego. Jej znajomy, Piotr jest przyjacielem Roberta z dziecistwa, czego Joanna nie jest wiadoma. Aby zaimponowa Joannie Piotr zaprosi Roberta na odbywajce si wieczorem przyjcie urodzinowe Joanny. Robert zaproszenie przyj i pojawi si na przyjciu jako niespodzianka dla Joanny. **Joanna nawet nie bierze pod uwag tego, e Robert mógby pojawi si na przyjciu.**

(5)   Joanna spodziewa si, e Robert Lewandowski nie przyjdzie na przyjcie.

Pytanie 2: Czy zdanie (5) jest prawdziwe w nowym kontekcie?

Odpowiedzi: Tak; Nie; Nie mam zdania.

Relation between P and Q complements

The first phase:

In the first phase of this part, the participants are presented with four stories (one by one) and for each story they are asked to assess whether a sentence is true. The sentence is assigned randomly but in such a way to make sure that each participant is presented whit one sentence of each form. The stories and the sentences are as follows:

Anna zdobywa wanie szczyt K2 i nie ma dostpu do informacji o zakoczonym wanie plebiscycie "Sportowiec Roku". Anna, wiedzc o ogromnej popularnoci Roberta Lewandowskiego uwaa, e to on zdoby tytu sportowca roku. Anna nie ma jednak racji, gdy plebiscyt wygraa Anita Wodarczyk.

(6)   Anna spodziewa si, e Robert Lewandowski zosta sportowcem roku.

(7)   Anna nie spodziewa si, e Anita Wodarczyk zostaa sportowcem roku.

(8)   Anna spodziewa si kto zosta sportowcem roku.

(9)   Anna nie spodziewa si kto zosta sportowcem roku.

Adam leci samolotem i nie ma dostpu do informacji o zakoczonym wanie finale konkursu piosenki "Eurowizja". Adam widzia pófinay i jego zdaniem, tak jak w zeszym roku, Wochy wygraj ten konkurs. Adam nie ma jednak racji, gdy zwycizc Eurowizji zostaa Hiszpania.

(10)   Adam spodziewa si, e Wochy wygray konkurs "Eurowizja 2022".

(11)   Adam nie spodziewa si, Hiszpania wygraa konkurs "Eurowizja 2022".

(12)   Adam spodziewa si który kraj wygra konkurs "Eurowizja 2022".

(13)   Adam nie spodziewa si który kraj wygra konkurs "Eurowizja 2022".

Agnieszka kpie si w morzu i nie ma dostpu do informacji o wanie ogoszonych wynikach wyborów prezydenckich. Agnieszka widziaa róne sondae i uwaa, e to kandydat Prawa i Sprawiedliwoci zosta prezydentem. Agnieszka nie ma jednak racji, gdy to kandydat Koalicji Obywatelskiej wygra wybory.

(14)   Agnieszka spodziewa si, e kandydat Prawa i Sprawiedliwoci zosta prezydentem.

(15)   Agnieszka nie spodziewa si, e kandydat Platformy Obywatelskiej zosta prezydentem.

(16)   Agnieszka spodziewa si kto zosta prezydentem.

(17)   Agnieszka nie spodziewa si kto zosta prezydentem.

Piotr leci samolotem i nie ma dostpu do informacji o zakoczonym wanie konkursie skoków narciarskich. W obliczu kompletnej dominacji japoskiego skoczka Ryoyu Kobayashiego w ostatnich konkursach Piotr uwaa, e Ryoyu wygra te dzisjejszy konkurs. Piotr nie ma jednak racji, gdy konkurs wygra Kamil Stoch.

(18)   Piotr spodziewa si kto wygra dzisiejszy konkurs.

(19)   Piotr nie spodziewa si kto wygra dzisiejszy konkurs.

(20)   Piotr spodziewa si, e dzisiejszy konkurs wygra wygra Ryy Kobayashi.

(21)   Piotr nie spodziewa si, e dzisiejszy konkurs wygra wygra Kamil Stoch.

The explicit scenarios:

Przeczytaj ponisz histori:

Jan i Piotr lec samolotem i nie maj dostpu do informacji o zakoczonym wanie konkursie skoków narciarskich. W obliczu kompletnej dominacji japoskiego skoczka Ryoyu Kobayashiego w ostatnich konkursach Piotr mówi do Jana: - Spodziewam si e dzisiejszy konkurs wygra Ryoyu Kobayashi. Piotr nie ma jednak racji, gdy konkurs wygra Kamil Stoch.

(22)   Piotr nie spodziewa si kto wygra dzisiejszy konkurs.

Pytanie 1: Czy zdanie (22) jest prawdziwe w tym kontekcie?

Odpowiedzi: Tak; Nie; Nie mam zdania.

Przeczytaj ponisz histori:

Jan i Piotr lec samolotem i nie maj dostpu do informacji o zakoczonym wanie konkursie skoków narciarskich. W obliczu kompletnej dominacji japoskiego skoczka Ryoyu Kobayashiego w ostatnich konkursach Piotr mówi do Jana: - Spodziewam si e dzisiejszy konkurs wygra Ryoyu Kobayashi. Piotr nie ma jednak racji, gdy konkurs wygra Kamil Stoch.

(23)   Piotr spodziewa si kto wygra dzisiejszy konkurs.

Pytanie 2: Czy zdanie (23) jest prawdziwe w tym kontekcie?

Odpowiedzi: Tak; Nie; Nie mam zdania.

C.2   Translation of the survey

Introduction and legal information

Welcome, my name is Tomasz Klochowicz, and I am a second-year Master of Logic student at the University of Amsterdam. At the beginning, I would like to thank

you for your participation in this study. It should take you no more than 10 minutes to answer all the questions. The survey consists of 10 questions, which do not have "right" or "wrong" answers. It would be best if you answered following your own intuitions. Some of the questions may seem similar, but please answer all of them, as only a full answer can be used in the study. The survey does not aim to test your general knowledge. Some of the questions may refer to real people or events, but the stories in the questions are completely made up for the sole purpose of this survey. If a story seems false or implausible to you, try to imagine the situation described by the story. If you have any questions, you can contact me by e-mail at: t.j.klochowicz@uva.nl.

Legal information: By answering the following questions, you are participating in a study being a part of "Cognitive Semantics and Quantities" project funded by European Research Council under the European Union's Seventh Framework Programme (FP/2007-2013)/ERC Grant Agreement n. STG 716230 CoSaQ. This research is conducted by Tomasz Klochowicz, under supervision of Jakub Szymanik and Floris Roelofsen, at the Institute for Logic, Language, and Computation, Department of Linguistics, University of Amsterdam. If you have questions about this research, please contact Tomasz Klochowicz at t.j.klochowicz@uva.nl. You must be at least 18 years old to participate. Your participation in this research is voluntary. You may decline to answer any or all of the following questions. You may decline further participation, at any time, without adverse consequences. Your anonymity is assured; the researchers who have requested your participation will not receive any personal information about you. If you have complains about this research, you can contact the Ethics Committee of the Faculty of Humanities of the Univesity of Amsterdam at commissie-ethiek-fgw@uva.nl; phone number +31 20 525 3054; Kloveniersburgwal 48, 1012 CX Amsterdam.

Question: I have read the legal information and I confirm that my participation in this study is voluntary. (Only the participants who accepted this statement could continue the survey.)

Question: How well do you speak Polish? (Only the participants who answered that they are a native speaker could continue the survey.)

Veridicality

Read the following story:

Anna and Peter have been together for a couple of years. Last evening Ann found an engagement ring in Peter's pocket. Today Peter invited Ann to a fancy restaurant for dinner. While preparing to go out, Ann is thinking: "Peter will propose to me today". However, Ann does not know that Peter has fallen in love with Barbara, and he wants to propose to Barbara soon. He invited Ann for dinner only to break up with her.

(24) Anna spodziewa si,   e   Piotr dzi   si   jej   owiadczy.
      Ann   expects   oneself, that Peter today himself to her will propose.
      "Ann expects that Peter will propose to her today."

Question: Is the sentence (24) true in the context of this story?

Answers: Yes; No; I don't know.

Projectivity under negation

Read the following story:

Marcin and Marzenna have been together for a couple of years. Today Marcin invited Marzena to a fancy restaurant for dinner. Marzena does not expect that today Peter will propose to her.

(25) Marcin dzi   owiadczy   si   Marzenie.
      Marcin today will propose himself to Marzena.
      "Marcin will propose today to Marzena."

Question 1: Is the sentence (25) always true in the context of this story?

Answers: Yes; No; I don't know.

Question 2: Does the sentence in boldface make sense as a continuation of the story? Judge at a scale from 1 to 5 where 1 means "does not make any sense" and 5 "Is a completely natural continuation.":

Marcin and Marzenna have been together for a couple of years. Today Marcin invited Marzena to a fancy restaurant for dinner. Marzena does not expect that today Peter will propose to her. **And she is right, because Marcin has no such intention.**

Neg-raising

Testing the premise of the neg-raising inference:

Read the following story:

Celina has not seen her childhood friend Barbara in years. Her husband, Marcin, learned that Barbara was back in their city, so, to surprise Celina, they invited Barbara for today's dinner to their place. Marcin and Barbara are waiting at the table for Celina, who is coming home from work.

(26) Celina nie   spodziewa si,   e   Barbara bdzie   dzi   na kolacji.
      Celina NEG expects   oneself that Barbara will be today for dinner.
      "Celina does not expect that Barbara will visit them for dinner today."

Question: Is the sentence (26) always true in the context of this story?

Answers: Yes; No; I don't know.

Testing the neg-raising inference:

Read the following story:

Joanna is a huge fan of Robert Lewandowski. Her friend, Peter, is Robert's childhood friend, and Joanna does not know about it. Peter invited Robert to Joanna's birthday party happening tonight to impress Joanna. Robert accepted the invitation, and he will be present at the party as a complete surprise for Joanna.

(27) Joanna spodziewa si,   e   Robert Lewandowski nie   przyjdzie na
      Joanna expects   oneself that Robert Lewandowski NEG will come to
      przyjcie.
      the party

"Joanna expects that Robert Lewandowski will not come to the party."

Question 1: Is the sentence (27) true in the context of this story?

Answers: Yes; No; I don't know.

Read the story with the boldface continuation:

Joanna is a huge fan of Robert Lewandowski. Her friend, Peter, is Robert's childhood friend, and Joanna does not know about it. Peter invited Robert to Joanna's birthday party happening tonight to impress Joanna. Robert accepted the invitation, and he will be present at the party as a complete surprise for Joanna. **Joanna does not even consider possible that Robert could come to the party.**

(28)   Joanna spodziewa si,   e   Robert Lewandowski nie   przyjdzie na
        Joanna expects   oneself that Robert Lewandowski NEG will come to
        przyjcie.
        the party
        "Joanna expects that Robert Lewandowski will not come to the party."

Question 2 : Is the sentence (27) true in the context of the extended story?

Answers: Yes; No; I don't know.

Relation between P and Q complements

The first phase:

In the first phase of this part, the participants are presented with four stories (one by one) and for each story they are asked to assess whether a sentence is true. The sentence is assigned randomly but in such a way to make sure that each participant is presented whit one sentence of each form. The stories and the sentences are as follows:

Anna is climbing the K2 and has no access to any information about the finished competition for the "Sportsperson of the year" title. Knowing that Robert Lewandowski is very popular, Anna thinks that he will win the title this year. However, she is not right because Anita Wodarczyk won the competition.

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(29) Anna spodziewa si,   e   Robert Lewandowski zosta
Anna expects   oneself that Robert Lewandowski became
sportowcem   roku.
the sportsperson of the year.
"Anna expects that Robert Lewandowski won the sportsperson of the year
title."

(30) Anna nie   spodziewa si,   e   Anita Wodarczyk zostaa
Ann   NEG expects   oneself that Anita Wodarczyk became
sportowcem   roku.
the sportsperson of the year
"Anna does not expect that Anita Wodarczyk wone the sportsperson of the
year title."

(31) Anna spodziewa si   kto zosta   sportowcem   roku.
Ann   expects   oneself who became the sportsperson of the year.
"Anna expects who won the sportsperson of the year title."

(32) Anna nie   spodziewa si   kto zosta   sportowcem   roku.
Ann   NEG expects   oneself who became the sportsperson of the year.
"Anna does not expect who won the sportsperson of the year title."

Adam is on the plane and has no access to any information about the finished "Eurovision 2022" song contest. Adam watched the semi-finals, and he thinks that, like last year, Italy will win the contest. However, he is not right because Spain won the "Eurovision 2022".

The sentences are analogical to the ones for the first story.

Agnieszka is swimming in the sea and has no access to any information about the presidential elections results. Agnieszka saw some pools and thinks that candidate A won the elections. However, he is not right because candidate B became the president.

The sentences are analogical to the ones for the first story.

Peter is on a plane and has no access to any information about the just-finished ski jumping competition. Peter, being aware of the complete domination of a Japanese ski jumper Ryy Kobayashi in the last week's competition, thinks that Ryy also won this week. However, he is not right because Kamil Stoch won the competition.

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The sentences are analogical to the ones for the first story.

The explicit scenarios:

Read the following story:

John and Peter are on a plane and has no access to any information about the just-finished ski jumping competition. Peter, being aware of the complete domination of a Japanese ski jumper Ryy Kobayashi in the last week's competition, says to John:

- I expect that Ryy Kobayashi won today's competition.

However, he is not right because Kamil Stoch won the competition.

(33) Piotr spodziewa si   kto wygra dzisiejszy konkurs.
      Peter expects   oneself who won   today's   competition.
      "Peter expects who won today's competition."

Question 1: Is the sentence (33) true in the context of this story?

Answers: Yes; No; I don't know.

Read the following story:

John and Peter are on a plane and has no access to any information about the just-finished ski jumping competition. Peter, being aware of the complete domination of a Japanese ski jumper Ryy Kobayashi in the last week's competition, says to John:

- I expect that Ryy Kobayashi won today's competition.

However, he is not right because Kamil Stoch won the competition.

(34) Piotr nie   spodziewa si   kto wygra dzisiejszy konkurs.
      Peter NEG expects   oneself who won   today's   competition.
      "Peter does not expect who won today's competition."

Question 2: Is the sentence (34) true in the context of this story?

Answers: Yes; No; I don't know.

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