The syntax and acquisition of modal verb flavors

by

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I always thought that writing the dissertation acknowledgments would mean that the dissertation finally feels real. It does not. But here we are, at the point where I thank the people who got me this far. Note that I didn’t say I have to thank anyone: I was raised with the saying Mora se samo umrijeti ‘Have to is only for dying.’ So without any sense of obligation, I want to thank the people who did the most to make this dissertation possible.

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This dissertation is an in-depth examination of the syntax of modal verbs and the ways in which they are acquired and processed by children and adults. In particular, the focus is on the epistemic/root modal flavor distinction, and how its syntax affects first language acquisition. There are two main theoretical contributions, the first being an analysis of the syntax of modal verbs in Bosnian/Croatian/Serbian (BCS). The second is an account of the cross-linguistically attested structural differences between epistemic and root interpretations of modal verbs, as conditioned by the syntax of modal verb complementation. A detailed analysis of modal verbs in BCS shows, through an array of syntactic diagnostics, that BCS modal verbs moći ‘can’ and morati ‘must’ are only interpreted as epistemic in biclausal (CP-embedding) constructions. This is in contrast to monoclausal constructions that these modal verbs are a part of when interpreted as root modals. Cross-linguistically, I show that modal verbs bearing agreement morphology and taking finite complements require a CP boundary between the modal verb and the embedded verb in order to be interpreted as epistemic. In languages where modal verbs take infinitival complements, a biclausal structure is a sufficient condition for epistemic interpretations, but not a necessary one. I provide empirical evidence for this theoretical analysis, examining in a child language corpus study the effect of these syntactic differences on the way modal verbs are acquired. The results of this corpus analysis show that BCS-learning children produce the more structurally complex epistemic modal verb constructions later than what has been reported for English learners, which I argue is best explained by language-specific
grammatical development. Finally, I present an experimental study, the results of which show that older preschool-aged BCS children show an epistemic bias consistent with that found in English learning children, despite the BCS input having a root bias and the syntax categorically differentiating the flavors. Taken as a whole, this thesis is a systematic examination of modal verbs in BCS and lays the groundwork for exploring the syntax and acquisition of modal verbs in other languages.
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Chapter 1

Introduction

1.0 Goals of the dissertation

Sentences containing modal words like *must* and *can* have multiple meanings depending on the context. For example, *John must be home* can be paraphrased in at least the following two ways: *John is surely home* and *John is obliged to be home*. The former interpretation, the one that expresses the speaker’s conclusion based on some evidence that John likely is indeed home, is referred to as the epistemic use of the modal *must*. The latter, which expresses something about John’s whereabouts in a world in which John abides by the rules imposed on him, either by himself or others, is the root use of *must*. Modal elements have these two types of interpretations in language after language, including English, German, French, Bulgarian, Bosnian/Croatian/Serbian (BCS) and others.

This dissertation uses novel data from BCS as a starting point to shed light on constructions involving modal verbs. I show the structural differences between their epis-
temic and root interpretations and argue that these different structures, often obscured on the surface, affect both the adult interpretations and the way children acquire language.

1.1 Epistemic vs. Root modality

The semantics given to modal expressions in the generative grammar tradition typically involves quantification over possible worlds (Gamut, 1991; von Fintel & Heim, 2011). This can be existential quantification – a sentence like John could be home can be paraphrased as There exist, in the set of possible worlds compatible with what I know in the actual world, worlds in which John is home. Or it can be universal quantification – John is surely home can be paraphrased as In all the possible worlds compatible with what I know in the actual world, John is home. This allows us to group modal expressions by what is referred to as modal force, into necessity (universal quantification) and possibility (existential quantification) modals.

Remember that John is surely home was one paraphrase of John must be home. The other paraphrase, John is obliged to be home, can be expressed as In all the possible worlds in which John is obeying the rules imposed on him, John is home. The force of quantification is the same. What differs is the set of possible worlds picked out, or the accessibility relation between our world and the worlds in which the proposition embedded under the modal is true. We can talk about the worlds in which John obeys rules, or the worlds compatible with my knowledge in the actual world, or the worlds compatible with someone’s physical abilities in the actual world. This enables us to group modal words based on the type of accessibility relation, or modal flavor.

The existing literature contains many ways to divide and group the modal flavors. Jespersen (1924), for example, divides them into those ‘containing an element of will’, and those that do not. The two groups loosely correspond to root and epistemic modal
flavors, although ability modals (which Jespersen refers to as potential) are grouped with epistemics as neither contain an element of will. Lyons (1977) discusses modals as falling into two categories, epistemic and deontic, where the former involve asserting or implying that a proposition is known or believed, while the latter deal with the necessity or possibility of acts by morally responsible agents. Palmer (1986) refers to propositional, as opposed to event modality. Propositional modality encompasses epistemic (expressing the speaker’s judgments about the factual status of the proposition) and evidential (indicating the evidence the speaker has for said status) (Palmer, 1986: 8)). Event modality encompasses deontic (obligation and permission imposed on the ‘relevant individual’) and dynamic (said individual’s ability and willingness).

I follow most syntactic literature discussing modal verbs and auxiliaries (Brennan, 1993; Marrano, 1998; Butler, 2003: i.a.), and divide the modal flavors into epistemic and root (referred to as circumstantial in the semantics literature, see Kratzer (1991; 2013), a.o.). Under epistemic, I subsume the flavors that deal with ‘matters of knowledge, belief’ (Lyons, 1977), and group ability, deontic, teleological and other circumstantial flavors together as root. I often use deontic flavor as a representative for the root flavors, as syntactically the root flavors tend to pattern together. Since I do occasionally refer to individual root flavors, I illustrate the types I refer to in (1) below. We see that the English modal auxiliary can denotes the subject’s physical ability in (1a), permission given to the subject (or someone who has control over the subject) in (1b), a possibility given the desires of the subject in (1c), or an inference based on the speaker’s world knowledge in (1d).

(1) a. After two years of weight lifting in the gym, John can lift this piano. (ability)
   b. Since his mom allows it, John can go on the field trip. (deontic)
   c. In order to get to the third floor, John can take the elevator. (teleological)
   d. We have no idea where he is, John can be hiding anywhere. (epistemic)
Throughout this dissertation, I refer to modal verbs and constructions containing them as ‘ambiguous’. By that, I intend to convey that a sentence such as John must be home can be interpreted in at least the two distinct ways described here. I argue that this is a result not of lexical ambiguity (where must has more than one lexical meaning) but rather structural ambiguity, where the sentence has more than one structure associated with it. This is consistent with much existing literature on the syntax of modality.

1.2 Syntax of modality

The distinction between epistemic and root modal flavors has been treated as a syntactic problem as early as Ross (1969), who argued that modal auxiliaries should be treated as verbs, with epistemic modal auxiliaries having a raising structure, whilst root modal auxiliaries have a control structure. This type of analysis, under which root modals have an external argument, has been followed by Roberts (1985), Picallo (1990) and Brennan (1993), among others. On the other hand, Picallo (1990), Bhatt (1998) and Wurmbrand (1999; 2001), among others, provide arguments against a control analysis of root modals and argue that all modal verbs are raising verbs.

While both root and epistemic uses of modal verbs have been argued to be raising verbs, this is not to imply that the structures of root and epistemic constructions are argued to be the same. Based on a range of languages, including Catalan (Picallo, 1990), Spanish (Marrano, 1998), English (Brennan, 1993), French and Italian (Hacquard, 2006), many authors have proposed that epistemic modals are structurally higher than root modals. The arguments vary, as do the final analyses. Picallo (1990), Brennan (1993), Cinque (1999), and Marrano (1998) propose that the different modal flavors are merged at distinct syntactic projections, although they do not agree on which projections are tied to which modal flavor. Hacquard (2006; 2010) argues that this is insufficiently explana-
tory of the cross-linguistic pattern, and proposes instead that the event-relative semantics of modals yields epistemic interpretations when they are merged above T, and root ones when below Asp. The details of the differences between the two approaches are discussed in Chapter 2.

In this dissertation I show that epistemic modal verbs being merged above Tense is necessary for the analysis of BCS modal verbs, but I also show that this is not sufficient to account for the BCS data. I tease apart the precise structures associated with the two types of meaning, capturing the fact that both types of structures can have the same utterance as their result. I do this through paying close attention to BCS, in which the sentences containing modal verbs can be ambiguous, like the English sentences shown here, but are often not. I apply a range of syntactic diagnostics to the BCS data to show that the two interpretations structurally differ. I analyze the data gathered through introspection and grammaticality judgments of native speakers, who complete a questionnaire. My analysis shows that in its epistemic use must is a CP-embedding verb, taking clausal complements, making the sentence in (2) structurally similar to [It must be the case [that Ana studies]]. Root uses, on the other hand, are structurally simpler, with (3) having the structure of [Ana must study].

(2) Mora da Ana uči
must DA Ana study
‘Ana must be studying.’ (epistemic)

(3) Ana mora da uči
Ana must DA study
‘Ana must study.’ (root)

I argue that the biclausal, CP-embedding analysis of epistemic modal verbs I propose for BCS is readily extended to puzzles involving an array of modal verbs in a number of languages, provided that the verb embedded under the modal is subjunctive (bears subject
agreement morphology). I discuss languages from Slavic, Romance and Semitic language families, as well as Modern Greek, and show that modal verbs that embed subjunctives pattern together, as opposed to the modal verbs that embed infinitival complements.

1.3 Syntax of modal verbs

One of the goals of this dissertation is to present an account of the syntax of modal verbs. In order to do that, I must first define clearly what is meant by modal verbs. To begin with, let us examine Portner’s (2009) definition of modal verbs in (4).

(4) The semi-modals of English (e.g., need (to), ought (to)) and verbs in other languages which do not meet the criteria for being an auxiliary in the English sense (e.g., Italian potere “can/may”, dovere “must”), provided that their proper syntactic analysis places them above the level of the predicate. (If any language has modal verbs which reside in the core predicate, in the manner of an ordinary lexical verb, they will be included in the category of sub-sentential modality.)

Portner (2009: 4)

As the criteria for being an auxiliary may differ cross-linguistically, I will attempt to narrow this definition down in a way that makes it more easily cross-linguistically applicable. Modal verbs are verbs, in the sense of morphosyntactically behaving like other verbs in the language. They are modal verbs in the sense that they semantically make reference to non-actual states and events. They, importantly, only select for one verbal/propositional argument, and are not involved in thematic relations with arguments that denote individuals.\(^1\) To summarize, I define the term ‘modal verb’ as in (5).

\(^1\)Part of this definition is used by Bester-Dilger et al. (2009), but applied to ‘modals’ more broadly, thus possibly leading to confusion when it comes to adverbs such as maybe.
Modal verbs are:

- **verbs** in that they syntactically behave as other verbs in the language (e.g. if all verbs agree with subjects, modal verbs do as well).
- **modal** in that they semantically make reference to non-actual states or events (i.e. they pertain to events that occur not in the actual worlds, but in worlds accessible from it); this may involve universal (necessity) or existential (possibility) quantification.
- **NOT** involved in thematic relations with arguments that denote invididuals, or arguments of the verbs embedded under them.

For the remainder of this dissertation, the term *modal verb* is to be taken as defined in (5). My focus is on the Bosnian/Croatian/Serbian modal verbs *morati* ‘must’ and *moći* ‘can’, but I discuss modal verbs in a range of other languages as well, occasionally discussing grammaticalized elements that were derived from modal verbs, such as the English modal auxiliaries *can* and *must*. The primary focus are modal verbs, however, so grammaticalized modal auxiliaries are not discussed in much detail.

### 1.4 Acquisition of modal verbs

Corpus work in the field of child language acquisition has shown that children between the age of 2 and 3 years old use modal auxiliaries only in root contexts (Stephany, 1979; Papafragou, 1998). Existing accounts for this lack of use of modal auxiliaries in epistemic contexts include those based in conceptual development, input-based accounts and grammatical accounts. Children were argued to not have deductive reasoning needed for epistemic interpretations of modal verbs (thinking about possibilities and probabilities) before the age of 3 (Papafragou, 1998). However, Cournane (2015a) showed that, during
this time, children produce epistemic adverbs such as *maybe* which arguably require the use of the same cognitive processes. Additionally, Cournane showed that children start using modal auxiliaries epistemically concurrently with the start of using TP-embedding verbs (cf. van Dooren et al. (2017)), arguing that it is grammatical development that enables children to use ambiguous modal words in epistemic contexts.

This dissertation presents the range of hypotheses from the first language acquisition literature, and discusses the impact that the corpus data from children acquiring BCS have on each of those hypotheses. The data from the SCECL corpus (Anđelković et al., 2001) are shown to provide further evidence against the theories based in conceptual development, and suggest that cross-linguistic syntactic differences may have an impact on the timelines of modal acquisition.

I show that the syntactic analysis I propose for BCS explains the child language acquisition facts. If modals embed finite clauses in their epistemic use, and adultlike use of embedded finite clauses is acquired later than other types of verbal complements (Pérez-Leroux, 1998; De Villiers & Roeper, 2016), children will acquire epistemic uses of modal verbs at the same time they start embedding clauses under other verbs. Through child language corpus analysis and linguistic experiments with children in Bosnia, I examine how the predictions of the analysis I argue for based on theoretical work correlate with the actual patterns of child language acquisition.

Much work has been done on the topic of modals in the field of semantics, and existing literature presents many reasons to believe that, structurally, the two versions of *John must be home* differ. However, no structural analysis offered so far answers both the ambiguity and the acquisition puzzles. This is the goal of my dissertation, which provides theoretically rigorous work that can be applied experimentally to solve a puzzle in child language learning.
1.5 A note on Bosnian/Croatian/Serbian

As is common in the literature studying the largest of the South Slavic languages, I will briefly remark on the way I refer to it in this dissertation. Bosnian/Croatian/Serbian (BCS) is a South Slavic language that is spoken, with dialectal variation, in Montenegro, Serbia, Bosnia and Herzegovina, and Croatia. In each of these countries, it was referred to as Serbo-Croatian (or Croato-Serbian) in Yugoslavia. It is now officially referred to as Montenegrin, Bosnian, Serbian, and Croatian, depending on the country one is in and ethnic and religious affiliations of the speaker. Thus a Catholic in Novi Sad, Serbia, or Sarajevo, Bosnia and Herzegovina, may refer to their language as Croatian. These varieties of Croatian, as spoken within the broader linguistic community of Novi Sad or Sarajevo, share dialectal features with the varieties of Serbian spoken in Novi Sad, or Bosnian spoken in Sarajevo, respectively.

I refer readers unfamiliar with the problems of language policy in the countries that were once Yugoslav republics to Tollefson (1993) for an overview of language policy changes in Yugoslavia before the wars of the 1990s and Bugarski (2004) for an overview of the language policies in the former republics in the early 21st century.

As linguists, we know that languages do have variation, and that the line between a language and a dialect is drawn arbitrarily, but it is our job to analyze language and thus we need to refer to it beyond only discussing idiolects. But to refer to Croatian without narrowing it down to ‘standard Croatian’ or ‘Croatian as spoken in Virovitica’\(^2\) means including the varieties spoken in Belgrade, Serbia or Zenica, Bosnia and Herzegovina. The same example can be given for any permutation of nationalities, countries and languages.

The phenomena analyzed in this dissertation have been discussed with speakers who identify as speakers of Bosnian, Croatian, Serbian, and Serbo-Croatian. Most of them

\(^2\)Or any other place, in Croatia or elsewhere.
were from Bosnia, but speakers from Serbia and Croatia were also consulted. The verbs discussed here exist in all the currently existing standards (alphabetically, Bosnian, Croatian, Montenegrin and Serbian). Within the language, Northwestern varieties (mostly in Croatia and Bosnia) use infinitives where Southeastern varieties (Southeastern Serbia) use DA subjunctives. I discuss this in Chapter 2. The focus here is on those dialects in which subjunctives are used. Unless stated otherwise, the data are sourced from my dialect, which is ijekavian and štokavian, acquired in Sarajevo, with influences of standard Croatian (taught in school in grades 4-8) and standard Bosnian.

While the language is tonal, tones are not marked in standard writing, and I will not be marking them unless needed to accentuate the difference between words that is not detectable from writing.

1.6 Dissertation outline

This dissertation proceeds as follows: in Chapter 2 I analyze the syntactic distinctions between the flavors of modal verbs as expressed in BCS and provide a precise syntactic account which shows that the analyses provided in the existing literature are both accurate and insufficient. I show that, in their epistemic uses, modal verbs are indeed syntactically higher than they are in their root uses, but also involve CP-embedding and biclausal constructions, while root modal constructions are monoclausal.

Chapter 3 extends the analysis from Chapter 2 to languages beyond BCS, showing that a CP barrier between the modal and the embedded verb is a sufficient condition for eliminating root readings of otherwise ambiguous modal verbs, even in languages in which it is not a necessary one. Furthermore, I show that, crosslinguistically, the modal verbs which obligatorily both show agreement morphology and embed agreeing (i.e. not infinitival) complements when interpreted as root, require a CP barrier and a lack of
agreement on the modal in order to be interpreted as epistemic. I propose a split between the modal verbs embedding subjunctive (agreeing) and those embedding infinitive (non-agreeing) complements and argue that this split correlates with CP-embedding in epistemic contexts being obligatory in the former case and optional in the latter. This split may then lead to different paths of grammaticalization of modal verbs, and differential patterns of modal verb acquisition.

I analyze modal verb acquisition patterns in BCS in Chapter 4, by examining modal verb use in BCS child language corpora. I show that, compared to English-learning children, BCS-learning children are delayed in acquiring epistemic uses of modal verbs. This is despite similar patterns of acquisition of both root uses of modal verbs and epistemic uses of unambiguous modal adverbs, suggesting that cognitive development is not conditioning the delay. I analyze usage frequency rates for epistemic and root uses of modal verbs and argue that they do not predict first epistemic uses of modal verbs to wait until the children are older than 4;0. Instead, I propose that the increased complexity of the CP-embedding biclausal structure is responsible for the delay in production.

I take the findings of the previous chapters as a starting point for Chapter 5, where I present a first language acquisition study done with preschool children. This study tests the hypothesis that a multitude of structural cues to modal flavor which exist in BCS aid children in comprehension, following an initial delay of epistemic uses. Surprisingly, given the differences in input and structural cues, the results show that BCS-speaking children and adults behave similarly to what is reported in existing literature for English speakers. I argue for a pragmatics-based account which captures the cross-linguistic results, and propose that inferences about obligation fulfillment account for the interpretation of necessity modal verbs.

In Chapter 6 I propose directions for future research and conclude.
CHAPTER 2

The syntax of BCS epistemic and root modal flavors

2.0 Introduction

This chapter analyzes the syntactic distinctions between the flavors of modal verbs as expressed in Bosnian/Croatian/Serbian (‘BCS’). The primary goal of the chapter is to account for how the distinction between the epistemic and root interpretations of the ambiguous modal verbs is reflected in and dependent on the structural environment of the modal verb. The starting point for the chapter is the following two sets of facts: one, the many differences between epistemic and root modality discussed in the previous literature (see Chapter 1) and two, the fact that expressions of epistemic and root modal interpretations often employ the same elements, both cross-linguistically and in BCS (van der Auwera & Ammann, 2013). A broadly accepted account for this problem assumes that the semantics of the modal are kept constant, while the differences are derived from the syntax (Brennan, 1993; Cinque, 1999; Hacquard, 2006, 2010, 2013; Kratzer, 2012 but cf. for
example Drubig, 2001 for arguments that the flavors differ in both syntactic and semantic terms). Deriving the different modal flavors from syntax enables us to capture the systematic differences between root and epistemic modals while maintaining Kratzer’s (1977; 1981; 2013) insights in the semantics.

Within this approach, there are multiple directions. The first possibility is that epistemic modals are raising verbs, while root modals are control verbs (Ross, 1969; followed by many others). Under such an analysis root modals assign a theta role to the subject, which captures the fact that they are subject-oriented and allow for modal complement ellipsis, as well as some other ways in which they differ from the epistemic modals. Wurmbrand (1999) rejects this split and argues that all modal verbs are raising verbs.

Another direction is that taken by Cinque (1999), who posits multiple functional projections for modals. Crucially, each functional projection is tied to a particular modal flavor, and the modal element itself is generated as a specifier of this projection. It is important to note that this approach does not differentiate between adverbial and verbal elements – as long as an element contributes epistemic modality, it is generated as a specifier of Mod\textsubscript{EpiP}. This analysis does account for distinct ways in which root and epistemic modal verbs interact with Tense (see §1.2), as the functional projection associated with epistemic modals (Mod\textsubscript{EpiP}) is posited to be higher than T, while those associated with root modals are merged below T (whether only Mod\textsubscript{RootP}, or a wider array of Mod\textsubscript{volition}, Mod\textsubscript{ability} etc.). This line has frequently been followed (see Butler 2003, among others) but does not significantly differ from positing lexical ambiguity. For each modal that can have both epistemic and root interpretations, we need to assume that it exists in multiple versions, each to be merged at an appropriate position. I.e., in order to merge must in the specifier of Mod\textsubscript{EpiP}, there needs to be a Must\textsubscript{Epistemic} in the lexicon, along with a Must\textsubscript{Deontic}, to be merged in the specifier of Mod\textsubscript{DeoP} when needed.
A final alternative is to avoid multiple single-flavor lexical entries, necessitated by Cinque’s tying structural positions to lexically determined modal flavor, by assuming that the syntactic position of a variable-flavor modal element determines its interpretation. This is the approach taken by Hacquard (2006, 2010, 2013). Hacquard proposes that modals are event-relative and thus can only be interpreted as epistemic if the modal is merged above T (which is where Cinque (1999) and others propose epistemics must be merged). When merged below T, in the scope of Asp, the modal’s event variable is bound by aspect, making it relativized to the VP event, which results in a root interpretation. This analysis, shown in (6), enables us to have a single, unified lexical entry for each modal, while still capturing the facts about the distinct syntactic behavior of different modal flavors.

It is important to note that, while they differ in the ways described above, both Cinque’s (1999) and Hacquard’s (2006) approach can be represented by the diagrams in (6). It is less than clear, syntactically, how the structure deriving the epistemic meaning in (6a) gets linearized to produce *John must be home*. If the modal is base generated above T, as it is for Cinque (1999), we can either assume a raising analysis for epistemics, which then embed a bare infinitival TP, or argue that the modal lowers to T. An alternative would be to argue that the modal is generated below T, as it is in (6b), but moves to its position in (6a) in LF. For purposes of PF, then, both root and epistemic sentences are in (6b).

(6)  

<table>
<thead>
<tr>
<th>a. Interpreted as epistemic</th>
<th>b. Interpreted as root</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Diagram" /></td>
<td><img src="image" alt="Diagram" /></td>
</tr>
</tbody>
</table>

In this chapter, I take as a starting point the uncontroversial assumption that epistemic modal constructions structurally differ from the root modal constructions (see §1.2). The
goal of this chapter is to take the analysis of epistemic-over-T, root-below-T as a starting point for BCS, and provide a precise syntactic account which shows that this starting point is both accurate and insufficient. The BCS data strongly suggest, based on an array of syntactic diagnostic tests, that epistemic modal constructions involve CP-embedding and are biclausal, while root modal constructions are monoclausal. This argument delivers a desirable result: the distinct interpretations available to the BCS modal verbs need not have lexical ambiguity as a source. Rather, they are derivable from the syntax. Additionally, the syntax does not need to incorporate two or more distinct projections or positions for a given modal verb.

A sketch of the analysis of a root modal verb construction is shown in (7). The modal takes as its complement an aspectually marked verb phrase introduced by the Mood head *da*. The verb phrase is headed by the embedded verb, in this case *jesti* ‘eat’.

\[(7) \text{Djeca, mora-ju da t, po-jed-u povrće} \]
\[\text{children.NOM must-3PL.PRS DA PFV-eat-3PL.PRS vegetables} \]
\[\text{‘The children must eat the vegetables.’} \]

The details of the aspectual morphology and the relationship between Mod and Asp will be discussed in both §2.4.2 and §2.5. For the time being suffice it to say that BCS
allows for two verbs inside the same TP to both be aspectually marked, and bear differing aspectual morphologies. This will be discussed in §2.1.3 as it pertains to BCS in general.

For epistemic modal verb constructions, a sketch of the analysis is in (8). As above, the modal verb takes as its complement a Mood phrase containing an aspectually marked vP, only now that vP is headed by an optionally silent infinitival *biti* 'be'. This verb, in turn, takes a propositional CP complement containing the embedded verb *jesti* 'eat'. Thus the complement of the modal itself is the proposition *it is (the case) that the children are eating*, rather than the event *the children eat*. The analysis will be discussed in greater detail in §2.5.

(8) Mora-∅ (bi-ti) da djeca, t. jed-u povrće
must-3SG.PRS be-INF DA children.NOM eat.IPFV-3PL.PRS vegetables
‘The children must be eating the vegetables.’ (epistemic)

TP₂
  T₂
    ModP
      Mod
        MoodP
          moda Mood AspP
            Asp vP
              v
            CP
              (biti) C
            TP₁
              da djeca jedu povrće

This chapter proceeds as follows: in §2.1 I present some general facts about BCS necessary for the reader to follow the arguments in favor of my analysis. In §2.2 I give an overview of BCS modal verbs, focusing on *moći* ‘can’ and *morati* ‘must’, which will be the focus of the remainder of the dissertation, but with some discussion of other modal verbs, in particular *trebati* ‘need’ (§2.2.1). I show that the ambiguity between epistemic
and root interpretations is present in BCS, albeit less common than in English (§2.2.2). Section §2.3 then presents three arguments for the analysis shown in (7) and (8) above: negation in §2.3.1, NPI licensing in §2.3.2, and ellipsis in §2.3.3. The facts presented in this section are shown to be incompatible with analyses that posit that epistemic modals embed TPs rather than CPs. In Section §2.4 an additional four arguments are presented, showing that facts from word order (§2.4.1), aspect (§2.4.2), tense (§2.4.3) and agreement (§2.4.4) all support my analysis. Section §2.5 presents the full picture of the analysis and discusses outstanding issues and directions for future research. Section §2.6 concludes.

2.1 Some general facts about BCS

Before discussing modal verbs, some background information about BCS is needed. This section covers the perfective forms of the present, which are only licit when licensed (§2.1.1), and the existence of da as both complementizer and a Mood head (§2.1.2), the latter of which acts as a licensor for perfective present. Additionally, I show that BCS allows for multiple agreement and present an analysis of this phenomenon (§2.1.3).

2.1.1 Present perfective and its licensors

All BCS verbs are aspectually marked, including in the infinitive (see e.g. Szucsich (2010)). Most verbs form a part of an aspectual pair, either in their base form (e.g. baci-ti ‘throw.PFV-INF’ and baca-ti ‘throw.IPF-INF’) or with one aspect derived from the other (e.g. pisa-ti ‘write.IPF-INF’ and na-pisa-ti ‘PFV-write-INF’). A small number of verbs have no aspectual pair and can be used as both perfective and imperfective (Barić et al., 1997), and some verbs, including biti ‘be’ have suppletive forms.

Both perfective and imperfective verbs can be used in all tenses (see Todorović (2016) for arguments against Tense in BCS), but there are important restrictions. The
present forms of perfective verbs are only licensed in future-oriented, conditional, habitual or root modal environments. These forms (also referred to as nonpast in terms of Bulatović 2008; Giannakidou 2009: and others) are anomalous in independent contexts, as shown in the contrast between the licit (9a) and the illicit (9b).

(9) a. Pada-∅ kiša.  
    fall.IPF-PRS.3SG rain  
    ‘It’s raining.’

    b. *Padn-e kiša.  
    fall.PFV-PRS.3SG rain  
    INTENDED: ‘It rains.’

Much like the subjunctive in Greek (Giannakidou, 2009: i.a.), present forms of perfective verbs (which I will from here on out sometimes refer to as present perfective) are licensed in conditional (10a) and future-oriented temporal (10b) clauses.

(10) a. Ne-če-mo ići [ako padn-e kiša].  
    NEG-will-1PL.PRS go.INF if fall.PFV-3SG.PRS rain  
    ‘We won’t go if it rains.’

    b. Čeka-ti če-mo [dok padn-e kiša].  
    wait-INF will-1PL.PRS while¹ fall.PFV-3SG.PRS rain  
    ‘We will wait until it rains.’

Another way to license the use of present perfective is through the use of temporal adjuncts which yield a habitual interpretation (11a), or through the use of ‘da’ in exclamatives and desideratives (11b).

(11) a. Ovdje svake sedmice padn-e kiša.  
    here every week fall.PFV-3SG.PRS rain  
    ‘It rains every couple of days here.’

    b. Da ti se sve želje ostvar-e!  
    DA 2SG.DAT.CL SE all wishes come.true.PFV-PRS.3PL  
    ‘May all your wishes come true!’ (Todorović & Wurmbrand, 2016)

¹Dok is, syntactically, introducing a temporal clause. Semantically, its contribution is either ‘while’ or ‘until’, depending on the verbal aspect and presence or absence of negation.
In (11b), *da* licences the use of the present perfective, but it is important to note that not every *da* does this. The following section details the difference between the complementizer *da* and the lower, Mood *da*, enabling the reader to assess the arguments for a biclausal (CP-embedding) analysis of epistemic uses of BCS modal verbs presented in this chapter.

2.1.2 Not every ‘*da*’ is C

The BCS *da* has been discussed in much previous literature (for an overview, see Todorović (2012)). Importantly, many arguments have been made for the existence of two distinct variants of *da*, which I refer to here as *da*$_1$ and *da*$_2$, following Browne (1986), Tomić (2004), and others. *Da*$_1$ is a traditional complementizer, heading CPs embedded under verbs such as *misliti* ‘think’, and taking fully clausal indicative complements. *Da*$_2$ takes subjunctive complements following verbs such as *željeti* ‘want’ and licenses the use of the perfective verbs in the present tense, which are not licensed in embedded CPs. The verb inside a CP headed by *da*$_1$ cannot be present perfective ((12a) vs. (12b)).

(12) a. Misli-m [da *pada-*∅] kiša].
  think.IPF-PRS.1SG DA$_1$ fall.IPF-PRS.3SG rain
  ‘I think it’s raining.’

b. *Misli-m [da *padn-e* kiša].
  think.IPF-PRS.1SG DA$_1$ fall.PFV-PRS.3SG rain
  INTENDED: ‘I think it’s raining.’

While Todorović (2012) states that the present forms of perfective verbs are acceptable following the epistemic CP-embedding *misliti* ‘think’ or factive *znati* ‘know’, (12b) contradicts this. Instances of the present perfective following verbs such as *misliti* ‘think’ are interpretable only when *misliti* is interpreted to mean ‘intend’, as in (13), which cannot be interpreted as ‘I think I’m eating an apple.’ As I cannot intend for it to rain, there is no interpretation available for (12b).
An alternative way for present forms of perfective verbs to be licensed under $da_1$ is by adding an element that allows for habitual interpretation of the embedded clause. An example would be a temporal adjunct such as 'every week', as in (14). Such temporal adjuncts license present forms of perfective verbs, as shown in (11a) in the previous section. Thus, given the facts in (11a) and (12b), we can conclude that the temporal adjunct, rather than $da_1$, licences the present perfective in (14).

One of the crucial differences between the two variants of $da$ lies in the fact that, while $da_1$ cannot accept present perfective verb forms in its complement, the Mood $da_2$ licences them, as shown in (11b) in §2.1.1, and also in (15a). This is in clear contrast to (12b) above, repeated here as (15b).

In recent work, Todorović & Wurmbrand (2015, 2016) discuss both of these instances of $da$, adding a third one, and I direct the reader to their work for arguments in favor of that analysis. Crucially, the problem of having multiple distinct homophonous functional elements is avoided by positing that $da$ is a phonological realization of finiteness, what
Todorović & Wurmbrand call a “finiteness visualizer”. This means that *da* spells out [+FINITE] in a clausal domain (in terms of Grohmann 2003) when no other elements are spelling it out. The two positions relevant for this dissertation are the φ-domain (mood) *da₂* and the Ω-domain (left periphery) complementizer *da₁*. The structure Todorović & Wurmbrand propose is in (16).

\(\text{(16)}\)

\[
\begin{array}{c}
\text{CP} \\
\text{C} \\
\text{ModP} \\
\text{**...**} \\
\text{Mod'} \\
\text{Mod} \\
\text{**...**} \\
\text{da} \\
\end{array}
\]

Rather than treat *da₂* as a modal (Mod) head, as Todorović & Wurmbrand do, I will follow Giannakidou’s (2009) analysis of the Greek *na*, as well as Mišeska-Tomić’s (2004; 2006) analysis of *da₂* itself, and treat it as a Mood head, allowing for Mod to be filled by modal verbs. Importantly, I will show that complements of epistemic uses of modal verbs syntactically pattern with complements of verbs such as *misliti* ‘think’ (I-verbs in terms of Progovac (1993a)), which take CP complements headed by *da₁*. Complements of root modal verbs, on the other hand, syntactically pattern with complements of verbs like *want* in (15a) (S-verbs in terms of Progovac (1993a)).²

Before moving on to the modal verbs, however, a discussion of Agreement is necessary, as it will be of importance in discussing the differences between modal flavors in BCS. The availability of multiple agreement will also be key in Chapter 3, when I will examine cross-linguistic similarities and differences when it comes to how the modal flavors structurally differ.

²While *misliti* ‘think’ and *željeti* ‘want’ take external arguments, modal verbs do not. The internal arguments are the focus here.
2.1.3 Multiple agreement and multiple aspects

BCS allows (even at times requires) the subject to agree with multiple heads – in compound tenses there are up to three verbal heads that show agreement morphology. As stated in Baker (2008), double agreement shows up in BCS when the lower verb is an “adjective-like participle, which agrees with the subject in number and gender but not in person” (Baker, 2008: 210). Multiple tenses\(^3\) are formed as Baker describes, including what is traditionally referred to as past tense in BCS. This is formed by combining the present form of the imperfective auxiliary \textit{biti} ‘to be’, usually in clitic form, with the participle form of the main verb. The auxiliary agrees with the subject in person and number, while the adjective-like \(l\)-participle\(^4\) agrees in number and gender. No element agrees with the full set of \(\phi\)-features. A full paradigm of the past tense of the imperfective verb \textit{padati} ‘fall.IP\textit{F}’ is in Table 2.1a, while a paradigm of its perfective counterpart \textit{pasti} ‘fall.PF\textit{V}’ is in Table 2.1b.

### Table 2.1 – A paradigm of the past tense

\[\begin{array}{cccc}
\phi & \text{Aux} & l\text{-PART} \\
1\text{SG} & \text{sam} & \text{-o/la/lo} \\
2\text{SG} & \text{si} & \text{pada-} \\
3\text{SG} & \text{je} & \text{pa-} \\
1\text{PL} & \text{smo} & \text{-li/le/la} \\
2\text{PL} & \text{ste} & \text{-li/le/la} \\
3\text{PL} & \text{su} & \text{-li/le/la} \\
\end{array}\]

(a) Imperfective \textit{padati}, ‘fall.IP\textit{F}’.

\[\begin{array}{cccc}
\phi & \text{Aux} & l\text{-PART} \\
1\text{SG} & \text{sam} & \text{-o/la/lo} \\
2\text{SG} & \text{si} & \text{-o/la/lo} \\
3\text{SG} & \text{je} & \text{-o/la/lo} \\
1\text{PL} & \text{smo} & \text{-li/le/la} \\
2\text{PL} & \text{ste} & \text{-li/le/la} \\
3\text{PL} & \text{su} & \text{-li/le/la} \\
\end{array}\]

(b) Perfective \textit{pasti}, ‘fall.PF\textit{V}’.

---

\(^3\)I use the word tense here and throughout this dissertation, partly for ease of following and partly because the debate of whether or not BCS has T and TP does not, as I understand it, have much bearing on the problems I’m discussing here. I will be assuming the existence of Tense in BCS, and I direct readers to Todorović (2016) for arguments to the contrary.

\(^4\)This is a standard term in the formal linguistics literature on Slavic languages (Tomić, 2006; Migdalski, 2006). Traditionally, these forms are referred to as ‘active verbal adjectives’ (Barić et al., 1997). I gloss them as past participles (PPT), acknowledging that they are not only used in the past tense.
Examples of sentences in the past tense are in (17).

(17)  

a. Djevojčiće su pa-le.  
girl-F.PL be.IPDECL.F.PL fall.PFV-F.PL  
“The girls fell.’

b. Djevojčica je pa-la.  
girl-F.SG be.IPDECL.F.SG fall.PFV-F.SG  
“The girl fell.’

c. Dječaci su pa-li.  
boy-M.PL be.IPDECL.F.PL fall.PFV-M.PL  
“The boys fell.’

The tense traditionally referred to as Future II is formed by combining the present form of the perfective biti ‘to be’ with the same participle form5 (18).

(18)  

a. Pjeva-j [kada kiš-e bud-u pada-le].  
sing-IMP when rain-F.PL be.PFV-3PL fall.IPDECL.F.PL  
‘Sing when it rains.’

b. Pjeva-j [ako kiš-a bud-e pada-la].  
sing-IMP if rain-F.SG be.PFV-3SG sing-F.SG  
‘Sing if it rains.’

c. Ne pjevaj [dok snijeg-∅ bud-e pada-o].  
NEG sing-IMP while snow-M.SG be.PFV-3SG sing-M.SG  
‘Don’t sing while it snows.’

However, unlike what is stated in Baker (2008), a compound tense exists in BCS where multiple verbal elements bear the subject’s person features. Future (traditionally referred to as Future I) is expressed, in Western variants, through combining the present form of the imperfective auxiliary htjeti ‘want/will’ with the infinitival form of the main verb (19).

5Given the facts about present perfective discussed in §2.1.1, it is unsurprising that most dialects only use this form in subordinate conditional or temporal clauses. There are dialects in Croatia which use this form as the only predicate in an indicative sentence, but those dialects typically do not use Future I.
In dialects where the subjunctive is more common (for a full discussion, see Tomić (2006)), Future I combines the present form of the imperfective auxiliary *htjeti* ‘want/will’ with *da₂* followed by the main verb in the present (perfective forms discussed in §2.1.1 and §2.1.2 are licit here). Thus, in Eastern dialects, the sentences in (19) are expressed as (20), with both verbal elements bearing agreement with the subject in person and number.⁷

(20) a. Kiša će da padne-∅.
    rain will.3SG.PRS.CL DA₂ fall.PFV-3SG.PRS
    ‘It will rain.’

    b. Ja ču da pjeva-m.
    I will.1SG.PRS.CL DA₂ sing-1SG.PRS
    ‘I will sing.’

---

6 *Htjeti* ‘will/want’ is one of the four fully irregular verbs in BCS (Barič et al., 1997). In present tense, its forms are based on the suppletive root *hoć*. Its clitic forms, such as *će* here, are made from present tense forms by removing *ho-*.  

7 Additionally, in South-Eastern Serbia, *da* can be omitted (Tomić, 2006), in which case the auxiliary is often grammaticalized and only used in its 3SG form although agreeing forms are possible. In (i) I show, going from the Northwest to the Southeast, the sentences used to express ‘I will get up at seven’:

(i) a. Ja bude-m u-sta-la u sedam.
    I be.IPF-1SG in-stand.PFV-1SG in seven
    ‘I will get up at seven.’
    (Northwest Croatia)

    b. Ja ču u-sta-ti u sedam.
    I will.1SG.PRS.CL in-stand.PFV-INF in seven
    ‘I will get up at seven.’
    (Croatia, parts of Bosnia)

    c. Ja ču da u-stane-m u sedam.
    I will.1SG.PRS.CL DA₂ in-stand.PFV-1SG.PRS in seven
    ‘I will get up at seven.’
    (Parts of Bosnia, Serbia)

    d. Ja ču u-stane-m u sedam.
    I will.1SG.PRS.CL in-stand.PFV-1SG.PRS in seven
    ‘I will get up at seven.’
    (Southeast Serbia)

    e. Ja će u-stane-m u sedam.
    I will.3SG.PRS.CL in-stand.PFV-1SG.PRS in seven
    ‘I will get up at seven.’
    (Southeast Serbia)
To account for multiple agreement, I adopt the proposal of Carstens & Kinyalolo (1989), including the modified Agreement Principle stated in (21):

(21) For all $\alpha^*, \beta^*$, where $^* = \text{agreement for some class or } \phi\text{-feature}, \text{agreement on } \alpha \text{ may differ from that on } \beta \text{ only if } \alpha \text{ and } \beta \text{ occupy projections of distinct syntactic categories.}

Thus the derivation for a sentence like (22) would proceed as follows:

(22) Ja ću da po-jede-m jabuku.
    I will.1SG.PRS DA2 PFV-eat-1SG.PRS apple
    ‘I will eat an apple’

Subject agreement with pojedem ‘eat.1SG.PRS’ happens when the subject is in Spec, AspP, while agreement with ću happens when the subject is in Spec, TP. Additionally, as both the auxiliary and the main verb are aspectually marked, I am going to posit that there are (at least) two Asp projections in the clausal spine. This correctly predicts that two distinct aspect markers can be seen on two different verbal elements, as in (23).
(23) a. Ja sam usta-la u pet.
   I be.IPF.PRS.1SG.CL get.up.PFV-PPT.F.SG in five
   ‘I got up at five.’

b. Ja sam usta-ja-la u pet.
   I be.IPF.PRS.1SG.CL get.up-IPF-PPT.F.SG in five
   ‘I got up at five (habitually).’ OR ‘I used to get up at five.’

c. Ako bude-m usta-la u pet, ne-ću
   if be.PFV-PRS.1SG.CL get.up.PFV-PPT.F.SG in five, NEG-will.1SG.PRS.CL
   biti ni-za-šta.
   be.INF NEG-for-what
   ‘If I’m up at five, I’ll be no good.’

d. Ako bude-m usta-ja-la u pet, to će
   if be.PFV-PRS.1SG.CL get.up-IPF-PPT.F.SG in five, will.3SG.PRS.CL
   biti zbog posla.
   be.INF because work
   ‘If I’m getting up at five, it will be for work.’

Following Carstens & Kinyalolo (1989) I will also assume that V raises to Asp if Asp is
an affix, whereas free Asp raises to T. With a free-standing Asp, agreement between the
lexical verb and the subject happens when the subject is at in the specifier position of the
lower Asp projection. The auxiliary (free-standing Asp) agrees with the subject when the
subject is in the specifier of the higher Asp, or possibly Spec, TP. The derivation for a
sentence with free-standing aspect is shown in (24) on the next page.

8In the absence of TP in BCS, the free Asp is the highest functional projection, and subjects move to its specifier.
Having discussed present perfective and its licensors (§2.1.1), including da₂ but not da₁, the differences between the types of da (§2.1.2), and the syntax of agreement and aspectual morphology on verbal elements in BCS in this section, I present the basic information about the modal verbs in the next section. After that, I discuss the strong §2.3 and weak §2.4 arguments for a CP-embedding structure for their epistemic interpretations as opposed to a monoclausal structure for root ones.

2.2 Some general facts about the BCS modals

In this section I discuss some basic properties of BCS modal verbs. To repeat from the introduction, for the purposes of this dissertation, I have defined the term ‘modal verb’ as in (25).
Modal verbs are:

- **verbs** in that they syntactically behave as other verbs in the language (e.g. if all verbs agree with subjects, modal verbs do as well).
- **modal** in that they semantically make reference to non-actual states or events (i.e. they pertain to events that occur not in the actual worlds, but in worlds accessible from it); this may involve universal (necessity) or existential (possibility) quantification.
- **NOT** involved in thematic relations with arguments that denote invididuals, or arguments of the verbs embedded under them.

Besters-Dilger et al. similarly state that a modal “always occurs with main verbs in the predicate position and opens one and only one argument position, which is filled by a lexical verbal stem” and “does not select its own nominal arguments but influences the encoding of the arguments of the verbal form.” (Besters-Dilger et al., 2009: 169)

This would eliminate verbs like htjeti ‘will/want’ and željeti ‘want’ which do meet the first two criteria, but not the third. The verbs meeting this set of criteria in BCS are listed in (26).

(26) a. *moći* ‘can’ – possibility  
   b. *morati* ‘must’ – necessity  
   c. *trebati* ‘need’ – weak necessity  
   d. *smjeti* ‘dare’/’be allowed to’ – possibility  
   e. *umjeti* ‘know-how’ – possibility

As this dissertation deals with the structural differences between epistemic and root modalities, I will not further discuss the last two verbs on this list, neither of which can receive
an epistemic interpretation. *Smjeti* is a root modal, most similar to English *dare*, (27a), which also conveys deontic possibility (the second use in (27b)). In the translation of (27a) I use *can*, but the ability to jump a whole flight of stairs without injuring yourself is not required to truthfully utter it. All that (27a) conveys is that I am willing to do it, and that I believe it requires some bravery to do it. The first use in (27b) has the same meaning, while the second could be ambiguous between challenging the statement that you dare, and the more salient meaning of not being allowed to (more salient due to the first use in the same sentence, and the ordering source in the second use being a parent).

(27) a. Ja smije-m skoči-ti s najviše stepenice.
   I dare-1SG jump-INF off tallest stair
   ‘I can/dare jump from the highest of these stairs.’

b. I ako smiješ, mama kaže-∅ da ne smiješ.
   and if dare-2SG, mom say-3SG.PRS DA NEG dare-2SG
   ‘Even if you can/dare, Mom says you can’t/are not allowed to.’

The verb *umjeti* is a root modal as well, with only an ability reading. Additionally, unlike the first three verbs in (26), it is not represented in all dialects of BCS. The issue of the interpretations available to *moći* ‘can’ where *umjeti* is represented in the dialect is an interesting one, but falls outside the scope of this dissertation.

Finally, this dissertation will also not focus on *trebati* but I will discuss it in some detail in §2.2.1. The verbs I will be dealing with in more detail are *moći* ‘can’ and *morati* ‘must’. Both of these verbs can be used in both epistemic and root contexts, with *moći* being the possibility, and *morati* the necessity modal verb. The full paradigm for both the verbs in the present tense is shown in Table 2.2 on the next page.

The perfective forms of *moći* ‘can’ (28a) and *morati* ‘must’ (28b) exist in some dialects, but many dialects lost them and use periphrastic forms shown in (28c) and (28d).
Table 2.2 – Present tense paradigms of moći ‘can’ and morati ‘must’.

<table>
<thead>
<tr>
<th>Subject φ-features</th>
<th>Moći</th>
<th>Morati</th>
</tr>
</thead>
<tbody>
<tr>
<td>1SG</td>
<td>mögu</td>
<td>moram</td>
</tr>
<tr>
<td>2SG</td>
<td>mžeš</td>
<td>moraš</td>
</tr>
<tr>
<td>3SG</td>
<td>mže</td>
<td>mora</td>
</tr>
<tr>
<td>1PL</td>
<td>mžemo</td>
<td>moramo</td>
</tr>
<tr>
<td>2PL</td>
<td>mžete</td>
<td>morate</td>
</tr>
<tr>
<td>3PL</td>
<td>mogul</td>
<td>moraju</td>
</tr>
</tbody>
</table>

The l-participle forms for both moći ‘can’ and morati ‘must’ are shown in Table 2.3. Their past and future forms are formed as discussed for non-modal verbs in previous sections.

Table 2.3 – l-participle paradigms of imperfective moći ‘can’ and morati ‘must’.

<table>
<thead>
<tr>
<th>Subject φ-features</th>
<th>Moći</th>
<th>Morati</th>
</tr>
</thead>
<tbody>
<tr>
<td>M.SG</td>
<td>mog(a)o</td>
<td>mor(a)o</td>
</tr>
<tr>
<td>F.SG</td>
<td>mogla</td>
<td>morala</td>
</tr>
<tr>
<td>N.SG</td>
<td>mogul</td>
<td>moralo</td>
</tr>
<tr>
<td>M.PL</td>
<td>mogli</td>
<td>morali</td>
</tr>
<tr>
<td>F.PL</td>
<td>mogle</td>
<td>morale</td>
</tr>
<tr>
<td>N.PL</td>
<td>mogla</td>
<td>morala</td>
</tr>
</tbody>
</table>
Before discussing the ambiguity that exists with these modal verbs, wherein an utterance can (depending on the context) have epistemic or root interpretations, I will briefly discuss the final verb mentioned in (26), namely trebati ‘need’.

2.2.1 A note on trebati ‘need’

The weak necessity modal verb trebati ‘need’ is, as in English, also used as a lexical verb. In most dialects of BCS, the lexical use of trebati calls for a dative subject with either nominal (29a) or clausal (29c) complements. In these cases, trebati agrees with the nominative complement (as in (29a) and (29b)) or is impersonal and bears default 3SG morphology (as in (29c)).

    1SG.DAT need-3SG.PRS chair-NOM.SG
    ‘I need a chair.’ (i.e. It is my need to have a chair)

b. Meni treba-ju stolic-e.
    1SG.DAT need-3SG.PRS chair-NOM.PL
    ‘I need chairs.’ (i.e. It is my need to have chairs)

c. Meni treba da radi-m za stol-om.
    1SG.DAT need-3SG.PRS DA work-1SG.PRS at desk-INS
    ‘I need to work at a desk.’ (i.e. It is my need to work at a desk)

In certain dialects, mainly in Croatia, a transitive trebati ‘need’ (as discussed in Harves & Kayne (2012)) exists and takes nominative subjects. In those dialects, trebati agrees with the subject, as in (30a). The existence of transitive ‘need’ correlates with the clausal complements of trebati being infinitival, as in (30b).

(30) a. Ja treba-m stolic-u.
    1SG.NOM need-1SG.PRS chair.ACC.SG
    ≈ ‘It is my need to have a chair.’
b. Ja treba-m radi-ti za stol-om.
1SG.NOM need-1SG.PRS work-INF at desk-INS
‘I need to work at a desk.’ (ambiguous)

Where sentences such as (30b) exist in a dialect, they are ambiguous between the lexical interpretation of (29c) and the functional use of trebati shown in (31). To clarify, (29c) is true if I personally find it very difficult to work on a couch, or on the floor. It doesn’t say anything about rules or requirements external to me. On the other hand, (30b) is true both if I am unable to do any work unless I am seated at a desk, but also if I am perfectly happy on the couch, yet due to the unspoken rules of the office etiquette it is expected that I be at a desk. In dialects where infinitives are rare (Eastern dialects, see Tomić (2006)) the functional interpretation of (30b) is conveyed by (31a), although speakers frequently use (31b), which is ambiguous in the same way (30b) is.

1SG.NOM need-3SG.PRS DA work-1SG.PRS at desk-INS
≈ ‘It is necessary that I work at a desk.’

b. Ja treba-m da radim za stolom.
1SG.NOM need-1SG.PRS DA work-1SG.PRS at desk-INS
‘I need to work at a desk.’ (ambiguous)

This distinction can be teased apart by clefting: while lexical use of trebati ‘need’ allows it (32a) and (32b), functional use does not (32c).

(32) a. Ono što meni treba je da radim.
that what 1SG.DAT need-3SG.PRS is DA work-1SG.PRS
‘What I need is to work.’

b. Ono što ja trebam je da radim.
that what 1SG.NOM need-1SG.PRS is DA work-1SG.PRS
‘What I need is to work.’
Prescriptive rules in Serbia strongly advise against the use of (31b), complicating the matters further (Simonović & Arsenijević, 2014). Looking, however, only at the sentences I stated were ambiguous, repeated here as (33a) and (33b), their ambiguity is between a lexical and functional interpretation of ‘need’, as shown below.

In the functional interpretation available to these sentences, the weak necessity modal can only have root interpretations. The same is true for (31a). Epistemic weak necessity interpretations can be derived with *trebati* ‘need’, but they require conditional morphology on top of what Simonović & Arsenijević (2014) refer to as the *bezlični filter* ‘impersonal filter’ (translation mine).

Let us imagine that me and my sister are looking at old pictures and we’re trying to determine what’s going on in a photo of us from decades ago. As a guess, I can say (34a), but not (34b), and certainly not (34c). The epistemic interpretation is compatible with a lack of agreement on *trebati* ‘need’, and incompatible with partial agreement in (34b) or full agreement in (34c). Let us also imagine that we’re looking at old pictures even though the reason we’re in the room with the photo albums is because we promised we’d help pack everything in that room into boxes. To remind you that we ought to get to it, rather than look at pictures, I can use one of the agreeing forms, partial one in (34b) or fully agreeing form in (34c). However, the prescriptive rules in Serbia guide speakers

(33)  
   a. Ja treba-m radi-ti.  
       1SG.NOM need-1SG.PRS work-INF  
   b. Ja treba-m da radim.  
       1SG.NOM need-1SG.PRS DA work-1SG.PRS  
       ‘It is my need to work.’ OR ‘It is needed that I work.’
to only use (34a), as agreeing forms are declared acceptable only when *trebati* ‘need’ is used as a lexical verb. Speakers of Serbian dialects are well aware of this normative rule (Simonović & Arsenijević, 2014) so (34a) is used in root contexts as well. The final option (34d), with the auxiliary *biti* ‘be’ agreeing with the subject, while the modal fails to agree, is very marked or simply ungrammatical.⁹

(34) a. Treba-lo   bi   da radi-mo.
   need-PPT.N.SG be.AOR.3SG DA work-1PL.PRS
   ‘We should be working.’ (i.e. odds are that we are working)

b. Treba-le   bi   da radi-mo.
   need-PPT.F.PL be.AOR.3SG DA work-1PL.PRS
   (e.g. rules suggest that us working is the optimal state of affairs)

c. Treba-le   bi-smo   da radi-mo
   need-PPT.F.PL be-AOR.1PL DA work-3PL.PRS
   (e.g. rules suggest that us working is the optimal state of affairs)

d. ??Treba-lo   bi-smo   da radi-mo.
   need-PPT.N.SG be-AOR.1PL DA work-1PL.PRS
   INTENDED: ‘We should be working.’

Much work is needed to tease apart the lexical and functional uses of *trebati*, and even more to then determine which of the functional uses have epistemic or root meanings. This I leave for future work, and will focus in this dissertation on the BCS modal verbs that are, unlike *trebati* ‘need’ exclusively functional, and unlike *smjeti* ‘dare’ and *umjeti* ‘know-how’ have both root and epistemic interpretations. The following section presents these modals, and contexts in which the sentences containing them are ambiguous.

⁹While Simonović & Arsenijević (2014) report on rare uses of such constructions, it is hard to tell whether use of the phrase ‘oni su trebalo’ on the internet is intended or a byproduct of the fact that *i* and *o* are adjacent, and the person typing intended to write ‘oni su trebali’ ‘they.M be.3PL need.PPT.M.PL’.
2.2.2 The ambiguity between root and epistemic readings

Some sentences containing the BCS modal verb morati ‘must’ are occasionally ambiguous between root and epistemic interpretations. Consider (35). If we are on our way to the zoo, and we know Ana cries the whole way home if, leaving the zoo, she realizes there are animals she hasn’t seen, we can say (35). *(In order for Ana not to cry...)*

\[
(35) \quad \text{Ana mora-∅ da vidi-∅ sve životinje.} \\
\text{Ana must-3SG.PRS DA see-3SG.PRS all animals} \\
\text{‘Ana must see all the animals.’}
\]

We can also say (35) if Ana is in a crow’s nest mounted on our Noah’s ark themed petting zoo, and we know it’s a position from which every animal is visible. *(... because, from up there, one can see everything.)* Vidjeti ‘see’ is a biaspectual verb (Barić et al., 1997), but imperfective verbs can also be embedded under morati ‘must’ and yield ambiguous sentences.

Ana’s parents can issue an order to the effect of a deontic interpretation of (36). Or Ana’s desire to have good grades can lead to a teleological interpretation of (36). Alternatively, we can be discussing the possible activities of all our friends, and if we know that Ana usually studies at this time of day, we say (36) with an epistemic interpretation.

\[
(36) \quad \text{Ana mora-∅ da uči-∅.} \\
\text{Ana must-3SG.PRS DA study-3SG.PRS} \\
\text{‘Ana must study.’ OR ‘Ana must be studying’}
\]

Finally, morati can be ambiguous between circumstantial, deontic, teleological and epistemic interpretations. The circumstantial reading of (37) is the most salient one: given the state of Fleki the dog’s bladder, Fleki must pee. The deontic reading requires a different context, and is much more salient if the sentence is restricted: for example, the dog must pee *when out on a walk*. This can be the rule in our household: we don’t take the dog back
in from the walk unless the dog pees first. This gives us the teleological reading as well: if Fleki wants to go back home, Fleki must pee. Finally, if we hear something from the other room, sounding suspiciously like a stream of liquid, we can say (37) with an epistemic interpretation.

(37) Fleki mora da piški.
Fleki must-3SG.PRS DA pee-3SG.PRS
‘Fleki must pee.’ OR ‘Fleki must be peeing.’

Despite the ambiguities that exist for morati ‘can’ (and moći ‘can’, historically and dialectally) I will show that these ambiguities are a result of a surface form conspiracy of subject φ-features, verbal aspect and topicalization. I will provide evidence there are two distinct structural analyses available for these surface forms: epistemic interpretations can only be derived from CP-embedding biclausal structures, while root interpretations are derived from simple monoclausal ones. I will argue that a sentence like (36) gets a root interpretation from the structure in (38), and is interpreted epistemically when in (39).

(38) [TP Ana i [T′ T [AspP ... [ModP mora [MoodP DA [vP t i uči]]]]]]

(39) [TopP [DP Ana i] ... [TP1 ... [ModP mora [MoodP ... [AspP ... [vP ... [CP DA [TP2 t i [T′ T [AspP ... [vP t i uči]]]]]]]]]]]]]

2.3 Arguments for a biclausal analysis

As stated in the introduction to this chapter, the assumption that epistemic modal constructions structurally differ from the root modal constructions serves as a starting point for this dissertation. This section provides arguments for the claim that the structures in (6), repeated as (40), cannot capture the behavior of modal verbs in BCS.
This is especially true for epistemic interpretations, which I argue cannot be derived from a structure such as (40a) and must instead have a biclausal structure as proposed in (39) and (8) in previous sections. The arguments for this come from negation (§2.3.1), NPI licensing (§2.3.2), and ellipsis (§2.3.3).

2.3.1 Negation

The interaction of modal elements and negation, in particular the scope relations between the two, has been extensively analyzed in previous literature. For example, Idris (1980) showed the following fact from Malay (41), which Drubig (2001) used, among other arguments, to show that epistemic modals consistently scope over sentential negation (and tense) (41a), while root modals scope under it (41b).

(41) a. Dia mesti tidak belajar
   he must not study
   ‘He must not study.’
   (epistemic □ > ¬)

b. Dia tidak mesti belajar
   he not must study
   ‘He must not study.’
   (¬ > deontic □)

BCS sentential negation (see Tomić, 2006) is a negative particle ne. This particle procliticizes onto verbs, be auxiliaries or future auxiliary will, and moves with them. Here I assume that ne is the head of NegP which is c-commanded by TP, but itself c-commands vP (but see Zeijlstra (2004) for arguments that, while NegP is between TP and vP, the
negation particle *ne* is head adjoined to the finite verb). This assumption is not central to the analysis. The structure for the simple sentence in (42) is then (43).

(42) Ana ne čita-∅
Ana NEG read.IPF-3SG.PRS
‘Ana doesn’t read.’ OR ‘Ana isn’t reading.’

(43)

```
TP
   /
  /   /
DP  T  NegP
   |   /
Ana_i T  Neg ne
   |   /
vP  /
    |  /
     |  /
    ne ti čita
```

BCS has fairly rigid scope, in that the surface order often determines scope relations. In this respect, BCS scope-taking elements (which both modals and negation are) act much like what Ionin & Luchkina (2014), among others, report for Russian quantifiers in emotively neutral sentences. Whether or not inverse scope can be derived by means of prosody doesn’t affect the data I discuss here – the modals take different scope in emotively neutral sentences based on the modal flavor.

In (44) we see that deontic modals scope under sentential negation.\(^{10}\) This is unsurprising, given the discussions in Drubig (2001) and Iatridou & Zeijlstra (2013), among others.

(44) a. Ana ne mora-∅ da čita-∅.
Ana NEG must-3SG.PRS DA read-3SG.PRS
‘Ana doesn’t have to read.’ ¬ □ (deontic, #epistemic)

---

\(^{10}\) For brevity and clarity of the argument, I only discuss deontic interpretations in this chapter. However, only epistemic interpretations are available to all examples labeled epistemic here, while every example labeled deontic can be interpreted as other root modal flavors in appropriate contexts.
b. Ana ne može-∅ da čita-∅.
   Ana NEG can-3SG.PRS DA read-3SG.PRS
   ‘Ana can’t read.’

Epistemic modals can also scope under negation, but their behavior differs from that of root modals. First, as will be discussed in detail in §2.4.1, the modal (and the negation) precedes the subject. Second, the modal is obligatorily followed by infinitival *biti ‘be’.*

(45) a. Ne mora-∅ *(bi-ti) da Ana čita-∅.
   NEG must-3SG.PRS be-INF DA Ana read-3SG.PRS
   ‘Ana doesn’t have to read.’
   ¬ > □ (epistemic, #deontic)

   NEG can-3SG.PRS be-INF DA Ana read-3SG.PRS
   ‘Ana can’t read.’
   ¬ > ◦ (epistemic, #deontic)

Modals scoping over negation can also be interpreted epistemically (46). In this configuration, the infinitival *biti ‘be’* is optional with the necessity modal (46a), while the possibility modal still requires its presence (46b).

   must-3SG.PRS be-INF DA Ana NEG read-3SG.PRS
   ‘Ana must be not reading.’
   □ > ¬ (epistemic, #deontic)

b. Može-∅ *(bi-ti) da Ana ne čita-∅.
   can-3SG.PRS be-INF DA Ana NEG read-3SG.PRS
   ‘Ana may be not reading.’
   ◦ > ¬ (epistemic, #deontic)

Additionally, it is possible for the negation scoping over and the negation scoping under the modal to co-occur when the modal gets an epistemic reading (47).

---

11This may be a strange sentence to get an epistemic reading for in English, so here’s some contextual help. Ana wears really thick glasses, and we are discussing the possible causes for her vision to be as bad as it is. Someone says “She has to read a lot.” I can then utter (45a), possibly followed by “She could just play a lot of games on her phone.” For (45b), the epistemic interpretation is more salient in English if we add *much.*
(47)  a. Ne mora-∅ *(bi-ti) da Ana ne čita-∅.
Neg must-3sg.prs be-inf da neg read-3sg.prs
‘Ana doesn’t have to not read.’ ¬ > □ > ¬ (epistemic, #deontic)

b. Ne može-∅ *(bi-ti) da Ana ne čita-∅.
Neg can-3sg.prs be-inf da neg read-3sg.prs
‘Ana can’t not read.’ ¬ > ○ > ¬ (epistemic, #deontic)

Deontic modals, as stated above, scope under negation, but it is also possible for them to take scope over negation (48).

(48)  a. Ana mora-∅ da ne čita-∅.
Ana must-3sg.prs da neg read-3sg.prs
‘Ana has to not read.’ □ > ¬ (deontic, #epistemic)

b. Ana može-∅ da ne čita-∅.
Ana can-3sg.prs da neg read-3sg.prs
‘Ana can not read.’ ○ > ¬ (deontic, #epistemic)

In cases such as (48), the negation is interpreted as constituent negation, as evidenced by the behavior of subject ni-NPIs. These NPIs are licensed by clausemate sentential negation (see Progovac (1991, 1993b)) and are licit in sentences with negation that takes scope over the deontic modal (49). However, when negation takes scope under the deontic modal, as in (48), subject ni-NPIs are not licensed (50).

(49)  a. Ni-ko ne mora-∅ da čita-∅.
Neg-who neg must-3sg.prs da read-3sg.prs
‘Nobody has to read.’ ¬ > □ (deontic, #epistemic)

b. Ni-ko ne može-∅ da čita-∅.
Neg-who neg can-3sg.prs da read-3sg.prs
‘Nobody can read.’ ¬ > ○ (deontic, #epistemic)

(50)  a. *Ni-ko mora-∅ da ne čita-∅.
Neg-who must-3sg.prs da neg read-3sg.prs
INTENDED: ‘Nobody has to read.’ ¬ > □ (deontic, #epistemic)
It is unclear why the sentences in (50) would be ungrammatical if *ne is sentential negation there, but the contrast between the examples in (50) and (49) is easily explained by the contrast between sentential and constituent negation.\footnote{12}

As this is a crucial argument for my analysis, let us further examine the differences in the behavior of sentential and constituent negation in BCS, borrowing tests from Klima (1964). First let us compare what is unambiguously sentential negation (51a) to unambiguously constituent negation – negation on the adjective modifying the complement of the verb in (51b), and negation on the nominal complement of the verb in (51c).

(51) a. Ana \textit{ni}-je pobijedi-la.\footnote{13} \\
Ana \textit{NEG}-be.3SG.PRS win-F.SG \\
‘Ana did not win.’

b. Ana je pobijedi-la u \textit{ne}-bitnoj utrci. \\
Ana be.3SG.PRS win-F.SG in \textit{NEG}-relevant race \\
‘Ana won an irrelevant race.’

c. Ana je pobijedi-la \textit{ne} Enu, nego Inu. \\
Ana be.3SG.PRS win-F.SG \textit{NEG} Ena rather Ina \\
‘Ana beat not Ena, but Ina.’

\footnote{12}{Unlike subject \textit{ni}-NPIs, object \textit{ni}-NPIs are licensed by VP constituent negation. If we are playing a game where Ana has to walk through a tangle of elastic, similar to pretending to be spies and and going through a room full of lasers, we can state the rules as in (i), but we cannot state the general rule by saying (ii).}

(i) Ana mora-∅ da ne dotakne-∅ ni-štta. \\
Ana must-3SG.PRS DA NEG touch-3SG.PRS NEG-what \\
‘Ana has to not touch anything.’

(ii) *Ni-ko mora-∅ da ne dotakne-∅ gumu. \\
\textit{NEG}-who must-3SG.PRS DA NEG touch-3SG.PRS elastic \\
INTENDED ‘Nobody has to touch the elastic.’

\footnote{13}{When attached to clitic forms of the auxiliary \textit{biti}, sentential negation appears as \textit{ni} rather than \textit{ne}.}
If we attempt to follow these sentences with a neither tag, we see a clear difference between (52a) on the one, and (52b) and (52c) on the other hand.

(52) a. Ana ni-je pobijedi-la, a ni Ena.
    Ana NEG-be.3SG.PRS win-F.SG and neither Ena
    ‘Ana did not win, and neither did Ena.’

    b. Ana je pobijedi-la u ne-bitnoj utrci, *a ni Ena.
    Ana be.3SG.PRS win-F.SG in NEG-relevant race and neither Ena
    INTENDED: ‘Ana didn’t win a relevant race, and neither did Ena.’

    c. Ana je pobijedi-la ne Enu nego Inu, *a ni Una.
    Ana be.3SG.PRS win-F.SG NEG Ena rather Ina and neither Una
    INTENDED: ‘Ana didn’t beat Ena, but Ina, and neither did Una.’

Examining sentences with morati ‘must’, we see that a ni ‘and neither’ tags can follow sentences in which the negation precedes (53a), but not those in which it follows root modal verbs (53b).

(53) a. Ana ne mora-∅ da pobijedi-∅, a ni Ena.
    Ana NEG must-3SG.PRS DA win-3SG.PRS and neither Ena
    ‘Ana does not have to win, and neither does Ena.’ (root)

    Ana must-3SG.PRS DA NEG win-3SG.PRS and neither Ena
    INTENDED: ‘Ana has to not win, and neither does Ena.’ (root)

The fact in (53a) supports the argument that negation that scopes above the root modal is sentential negation. However, the fact in (53b) proves insufficient to rule out sentential negation. Examining negation on embedding verbs, we see that for both znati ‘know’ and željeti ‘want’, the negation on the embedding verb licences the use of a a ni ‘and neither’ tag regardless of the complement size – see (54a) and (54b). The negation on the embedded verb licences a ni ‘and neither’ tags with CP-embedding znati ‘know’ if the subject of the embedded verb is overt (54c), but not with a covert, coreferential subject
(54d). With a verb like željeti ‘want’, negation on the embedded verb does not license a ni ‘and neither’ tag regardless of whether the subject is overt (54e), or covert (54f).

(54) a. Ana ne zna-∅ da je pobijedi-la, a ni Ena.
Ana NEG know-3SG.PRS DA be.3SG.PRS win-F.SG and neither Ena
‘Ana does not know that she won, and neither does Ena.’

b. Ana ne želi-∅ da pobijedi-∅, a ni Ena.
Ana NEG want-3SG.PRS DA win-3SG.PRS and neither Ena
‘Ana does not want to win, and neither does Ena.’

c. Ana zna-∅ da Ina ni-je pobijedi-la, a ni Ena.
Ana know-3SG.PRS DA Ina NEG-be.3SG.PRS win-F.SG and neither Ena
‘Ana knows that Ina didn’t win, and neither did Ena.’

Ana know-3SG.PRS DA NEG-be.3SG.PRS win-F.SG and neither Ena
INTENDED: ‘Ana knows that she didn’t win, and neither did Ena.’

Ana want-3SG.PRS DA Ina NEG win-3SG.PRS and neither Ena
‘Ana wants Ina to not win, and Ena neither.’

Ana want-3SG.PRS DA NEG win-3SG.PRS and neither Ena
INTENDED: ‘Ana wants to not win, and neither does Ena.’

As the subject of the embedded verb in (53b) is obligatorily coreferential with the apparent subject of the modal verb, it is possible that this rules out the use of the a ni ‘and neither’ tag. This leaves open the possibility that the negation in (53b) is sentential negation of the embedded sentence. We can, however, dismiss that possibility by using another Klima test, the negative appositive tag čak ni ‘not even’. Sentential negation licences it (55a), while constituent negation does not (55b) and (55c).

(55) a. Ana ne-če pobijedi-ti, čak ni sada.
Ana NEG-will.3SG.PRS win even neither now
‘Ana will not win, not even now.’
b. Ana je pobijedi-la u ne-bitnoj utrci, *čak ni kratkoj.
   Ana be.3SG.PRS win-F.SG in NEG-relevant race even neither short
   INTENDED: ‘Ana didn’t win a relevant race, not even a short one.’

c. Ana je pobijedi-la ne Enu, *čak ni Inu.
   Ana be.3SG.PRS win-F.SG NEG Ena even neither Ina
   INTENDED: ‘Ana didn’t beat Ena, not even Ina.’

Negation scoping over embedding verbs such as znati ‘know’ and željeti ‘want’ licences
the use of čak ni ‘not even’, as shown in (56a) and (56b).

(56) a. Ana ne zna-∅ da pobijedu-j-e, čak ni sada.
   Ana NEG know-3SG.PRS DA win.IPF-3SG.PRS even neither now
   ‘Ana does not know that she’s winning, not even now.’

b. Ana ne želi-∅ da pobijedi-∅, čak ni sada.
   Ana NEG want-3SG.PRS DA win.PFV-3SG.PRS even neither now
   ‘Ana does not want to win, not even now.’

With negation that takes scope under the matrix verb, there is a contrast between znati
‘know’ and željeti ‘want’, regardless of the presence of the embedded subject. Compare
the licit use of not even in (57a) and (57b) to the illicit (57c) and (57d).

(57) a. Ana zna-∅ da Ena ne pobijedu-j-e, čak ni sada.
   Ana know-3SG.PRS DA Ena NEG eat-3SG.PRS meat even neither chicken
   ‘Ana knows that Ena is not winning, not even now.’

b. Ana zna-∅ da ne-če pobijedi-ti, čak ni sada.
   Ana know-3SG.PRS DA NEG eat-3SG.PRS meat even neither chicken
   ‘Ana knows that she will not win, not even now.’

   Ana want-3SG.PRS DA Ena NEG eat-3SG.PRS meat even neither chicken
   INTENDED: ‘Ana wants Ena to not win, not even now.’

   Ana want-3SG.PRS DA NEG eat-3SG.PRS meat even neither chicken
   INTENDED: ‘Ana wants to not win, not even now.’
Crucially, the negation that takes scope under the root modal does not license the use of čak ni ‘not even’ tags (58a), although both negation that scopes over the root modal (58b) and negation that take scope under the epistemic modal (58c) do.

\[(58)\]

\[a. \text{Ana} \text{mora-∅} \text{da ne jede-∅ meso, *čak ni piletinu.} \]

\[\text{Ana must-3SG.PRS DA NEG eat-3SG.PRS meat even neither chicken} \]

\[\text{INTENDED: ‘Ana has to not eat meat, not even chicken.’}^{14} \text{ (root)} \]

\[b. \text{Ana ne mora-∅ da jede-∅ meso, čak ni piletinu.} \]

\[\text{Ana NEG must-3SG.PRS DA eat-3SG.PRS meat even neither chicken} \]

\[\text{‘Ana does not have to eat meat, not even chicken.’} \text{ (root)} \]

\[c. \text{Mora-∅ da Ana ne jede-∅ meso, čak ni piletinu.} \]

\[\text{must-3SG.PRS DA Ana NEG eat-3SG.PRS meat even neither chicken} \]

\[\text{‘Ana must not eat meat, not even chicken.’} \text{ (epistemic)} \]

Thus we see that the negation that takes scope under the root uses of the modal verb morati ‘must’ patterns with constituent vP negation, rather than sentential negation. Additionally, sentential and constituent negation can co-occur, and when they do, sentential negation outscopes the modal (59).

\[(59)\]

\[a. \text{Ana ne mora-∅ da ne čita-∅.} \]

\[\text{Ana NEG must-3SG.PRS DA NEG read-3SG.PRS} \]

\[\text{‘Ana doesn’t have to not read.’} \quad \neg \square \neg \quad (\text{deontic, #epistemic}) \]

\[b. \text{Ana ne može-∅ da ne čita-∅.} \]

\[\text{Ana NEG can-3SG.PRS DA NEG read-3SG.PRS} \]

\[\text{‘Ana can’t not read.’} \quad \neg \spadesuit \neg \quad (\text{deontic, #epistemic}) \]

To summarize, BCS allows negation to scope both over and under epistemic and root modals, although the negation that takes scope under root modals appears to be constituent negation. If both types of modals are in the same clause, we cannot derive sentential negation scoping both over and under the epistemic modal unless we assume two

\[^{14}\text{With an epistemic interpretation, where we’re making inferences about Ana’s diet, and Ana is interpreted as Topic, the use of the tag is licensed.}\]
distinct positions for sentential negation. This is not impossible (see Zanuttini 2001), but with the negation particle being the same and having the same contribution, it would not be the most elegant solution. Assuming the existence of two clauses in epistemic modal constructions allows us to have one sentential negation per clause, and would account for the data presented here.

The following sections will provide more arguments for a biclausal analysis, starting with NPI licensing, which I touched upon here.

### 2.3.2 NPI licensing

NPIs provide the key argument for positing a CP barrier between the epistemic modal and the verb embedded under the modal. Progovac (1991, 1993b) shows that *ni*-NPIs in BCS are licensed by clausemate negation only, whereas *i*-NPIs are only licensed by superordinate negation.\(^\text{15}\) In this section, I show that negation that scopes over the epistemic modal is not in the same clause as the vP embedded under the modal. Conversely, I show that negation that scopes over the root modal is in the same clause as the embedded vP.

To begin, observe that negation that scopes under the modal licences object *ni*-NPIs regardless of force and flavor (60).

\[(60)\]
\[
a. \text{Mora-∅ da djeca ne jed-u ni-štta.} \quad \text{must-3SG.PRS DA kids NEG eat.IPF-3PL.PRS NEG-what} \\
\quad \text{‘The kids must not eat anything.’} \quad \Box > \neg (\text{epistemic, #deontic})
\]
\[
b. \text{Djeca mora-ju da ne po-jed-u ni-štta.} \quad \text{kids must-3SG.PRS DA NEG PFV-eat-3PL.PRS NEG-what} \\
\quad \text{‘The kids must not eat anything.’} \quad \Box > \neg (#\text{epistemic, deontic})
\]
\[
c. \text{Može-∅ bi-ti da djeca ne jed-u ni-štta.} \quad \text{can-3SG.PRS be-INF DA kids NEG eat.IPF-3PL.PRS NEG-what} \\
\quad \text{‘The kids may not eat anything.’} \quad \Diamond > \neg (\text{epistemic, #deontic})
\]

\(^{15}\)An exception to this exists with object NPIs, see Progovac (1993b). Note that I have shown that subject *ni*-NPIs are licensed by negation that takes scope over root modals in the previous section.
On the other hand, *ni*-NPIs are only licensed by negation that takes scope over the deontic modal (61a) and (61b), and are not licensed by negation that takes scope over the epistemic modal, be it epistemic necessity (61c) or epistemic possibility (61d).

(61)  

(a) Djeca ne mora-ju da po-jed-u ni-šta/*i-šta.
    kids  NEG must-3SG.PRS DA PFV-eat-3PL.PRS NEG-what/i-what
    ‘The kids don’t have to eat anything.’  ¬ > □ (#epistemic, deontic)

(b) Djeca ne mog-u da po-jed-u ni-šta/*i-šta.
    kids  NEG can-3SG.PRS DA PFV-eat-3PL.PRS NEG-what/i-what
    ‘The kids may not eat anything.’  ¬ > ◊ (#epistemic, deontic)

c. Ne mora-∅ (bi-ti) da djeca jed-u *ni-šta/i-šta.
    NEG must-3SG.PRS be-INF DA kids  eat.IP-3PL.PRS neg-what/i-what
    ‘The kids must not eat anything.’  ¬ > □ (epistemic, #deontic)

d. Ne može-∅ bi-ti da djeca jed-u *ni-šta/i-šta.
    NEG can-3SG.PRS be-INF DA kids  eat.IP-3PL.PRS neg-what/i-what
    ‘The kids can’t be eating anything.’  ¬ > ◊ (epistemic, #deontic)

In this, deontic modals act like subjunctive embedding verbs such as *željeti* ‘want’ and *voljeti* ‘love’, while epistemic modals act like indicative CP-embedding verbs such as *misliti* ‘think’ and *tvarditi* ‘claim’, see Progovac (1991, 1993b).

As clausemate negation licences *ni*-NPIs, we conclude that negation that takes scope over the epistemic modal is not in the same clause as the NPI. Additionally, the distribution of *i*-NPIs, which are only licensed by superordinate negation, and have a mirror-image distribution compared to the *ni*-NPIs, reinforces the claim that the NPI in (61c) and (61d) is in an embedded clause, whereas it is in the matrix in (61a) and (61b).
For *ni*-NPIs and the negation that outscopes modals with epistemic interpretation to co-occur, another negation has to be present, taking scope under the modal and over the embedded verb (62).

(62) a. Ne mora-∅ (bi-ti) da djeca ne jed-u ni-šta.
    NEG must-3SG.PRS be-INF DA kids NEG eat.IPF-3PL.PRS NEG-what
    ‘It doesn’t have to be the case that the kids don’t eat anything.’
    \(\neg > \Box > \neg\) (epistemic, #deontic)

b. Ne može-∅ bi-ti da djeca ne jed-u ni-šta.
    NEG can-3SG.PRS be-INF DA kids NEG eat.IPF-3PL.PRS NEG-what
    ‘It can’t be the case that the kids don’t eat anything.’
    \(\neg > \Diamond > \neg\) (epistemic, #deontic)

This is not predicted by the analyses in which epistemic modals scope above T, but are part of the same CP as the embedded verb. If both epistemic and root structures are monoclausal, it is unclear why *ni*-NPIs are not licensed in (61c) and (61d). On the other hand, if epistemic modal constructions are biclausal, this is independently accounted for by the behavior of BCS NPIs. This is shown through the structures of (61a) and (61c), represented in (63) and (64)

(63) \[TP \text{Djeca} [T' \text{T} [\text{NegP} \text{ne} [\text{AspP} ... [\text{ModP} \text{t} [\text{Mod}^\prime \text{moraju} [\text{MoodP} \text{DA [vP \text{t} \text{i} \text{pojedu ni-šta]}]]]]]]]]

(64) \[TP_1 [\text{NegP} \text{ne} [\text{AspP} ... [\text{ModP} \text{mora} [\text{MoodP} ... [\text{AspP} ... [\text{vP \text{biti [CP \text{DA [TP_2 \text{djeca [T'} \text{T} [\text{AspP} ... [\text{vP \text{t} \text{i} \text{jedu i-šta]}]]]]]]]]]]]]]]]

Finally, in this sense root interpretations of modal verbs act much like future-oriented verbs such as *željeti* ‘want’, whereas epistemic interpretations act like CP-embedding verbs such as *misliti* ‘think’ (cf. Todorović 2012). This is consistent with the analysis of root modals I give here (which is quite standard – see, among others, an analysis of root
modals offered by Wurmbrand (2001)). Crucially, root modals differ from restructuring verbs such as početi ‘begin’, pokušati ‘try’ and even željeti ‘want’ in that they are not in a θ relation with the subject, although they are syntactically in an agreement relation. The same difference exists between the epistemic modals and CP-embedding verbs: while misliti ‘think’ has an external argument, morati ‘must’ does not. Further differences exist, but I will return to them after discussing additional arguments for a biclausal analysis of epistemic modal verbs in BCS, starting with ellipsis in the next section.

2.3.3 Ellipsis

More evidence that the negation scoping over deontic modals is sentential negation comes from the ellipsis facts. It has been noted in previous literature that the following are all possible: VP ellipsis (VPE), modal complement ellipsis (MCE) and clausal ellipsis (see, for example Van Craenenbroeck & Merchant (2013)). Turning to the three types of BCS verbs discussed in Todorović & Wurmbrand (2015), where verbs with da-complements were grouped by complement size, we see in (65a) that eliding a da2-headed MoodP is available in BCS, but CP ellipsis is not available in the same environment (65b).

(65) a. Ana ne svira-∅ klavir, samo pokuša-va-∅
Ana NEG play.IP3 SG.PRS piano just try-IP3 SG.PRS
‘Ana isn’t playing the piano, she is just trying (to play it).’

b. *Ana ne svira-∅ klavir, samo misli-∅
Ana NEG play.IP3 SG.PRS piano just think.IP3 SG.PRS
INTENDED: ‘Ana isn’t playing the piano, she just thinks (she is).’

The elided complement in (65a) would have been a subjunctive MoodP introduced by da2, or alternatively a fully aspectually marked infinitival complement in dialects that have a rich use of infinitive (most dialects in Croatia and Northwest Bosnia). I will not discuss
whether or not MoodP is projected over aspectually marked infinitives, but merely state
that what I refer to as VP ellipsis here elides such complements as well.

Further, in (66), we see that TP ellipsis is also possible in BCS (66a), but CP ellipsis
is not available (66b).

(66)  a. Ana obeća-va-∅ da će donije-ti kišobran, a
Ana promise-IPF-3SG.PRS DA will.2SG.PRS.CL bring-INF umbrella and
obeća-va-m i ja.
promise-IPF-1SG.PRS too I
‘Ana promises to bring an umbrella, and I promise too!’

       b. *ANA kaže-∅ da će donije-ti kišobran, a kaže-m
Ana say-3SG.PRS DA will.2SG.PRS.CL bring-INF umbrella and say-1SG.PRS
i ja.
too I
INTENDED: ‘Ana says she will bring an umbrella, and I say too!’

Modal complement ellipsis is available with root modals (67) and (68).

Ana must-3SG.PRS DA PFV-read-3SG.PRS this book.F-ACC.SG
‘Ana must read this book.’

       (deontic □)

       B: Ne mora-∅.
NEG must-3SG.PRS
‘She must not.’

       (¬ > □)

(68)  Ana mora-∅ da donese-∅ kišobran, a mora-m i ja.
Ana must-3SG.PRS DA bring-3SG.PRS umbrella and must-1SG.PRS too I
‘Ana must bring an umbrella, and I must too!’

This is not surprising, given the analysis in (38) above, repeated here as (69). If the modal
complement is a MoodP which can be elided, as shown in (65a), modal complement el-
ipsis should be available with root interpretations of the modal.

(69)  [TP Ana i [T T [AspP ... [ModP mora [MoodP DA [VP t i uči]]]]]]
When it comes to epistemic modals, however, the predictions of my analysis depend on the presence of *biti* ‘be.*INF*. Note that the presence of this verb in the infinitive yields a parallel structure for epistemic and root uses of the modal verb, which takes a subjunctive MoodP or infinitive MoodP/AspP regardless of the flavor. In this environment, my analysis predicts that eliding the modal complement should be possible.

(70)  

\[
\text{Mora-∅} \quad \text{bi-ti} \quad \text{da djeca,} \quad \text{tjedu povrće} \\
\text{must-3SG.PRS} \quad \text{be-INF} \quad \text{DA} \quad \text{children} \quad \text{eat} \quad \text{vegetables} \\
\text{‘The children must eat the vegetables.’} \\
\text{(epistemic)}
\]

Indeed, with an overt *biti* ‘be.*INF*, eliding the epistemic modal complement is marked for some speakers (71), but possible and acceptable in constructions such as (72) for all the speakers I’ve consulted.

(71)  

\[
\begin{align*}
\text{A:} & \quad \text{Mora-∅} \quad \text{bi-ti} \quad \text{da je} \quad \text{Ana u biblioteci.} \\
& \quad \text{must-3SG.PRS} \quad \text{be-INF} \quad \text{DA} \quad \text{be.IPF.PRS.3SG} \quad \text{Ana in library} \\
& \quad \text{‘Ana must be in the library.’} \\
& \quad \text{(epistemic □)}
\end{align*}
\]

\[
\begin{align*}
\text{B:} & \quad \text{?Ne} \quad \text{mora-∅} \\
& \quad \text{NEG} \quad \text{must-3SG.PRS} \\
& \quad \text{‘She must not.’} \\
& \quad \text{(! > □)}
\end{align*}
\]

51
Može-∅ bi-ti da je Ana u bibliotecì, ali ne mora-∅.
(can-3SG.PRS be-INF DA be.IPF.PRS.3SG Ana in library but NEG must-3SG.PRS
‘Ana can be in the library, but she doesn’t have to (be in the library)’
(epistemic ○, epistemic □)

The analysis in which epistemic modals scope above T also predicts modal complement ellipsis (MCE) to be available, and unrestrictedly so, given the availability of TP ellipsis shown in (66a). However, Aelbrecht (2008, 2012) showed that MCE is available with root, but not epistemic interpretations in Dutch. Ross (1969) showed the same for German. In BCS, the acceptability of MCE with epistemic modals is limited to cases that contain overt biti (71) and (72). Without biti, the degraded (71) is unacceptable (73).

A: Mora-∅ da je Ana u bibliotecì.
(must-3SG.PRS DA be.IPF.PRS.3SG Ana in library
‘Ana must be in the library.’
(epistemic □)

B: *Ne mora-∅.
(NEG must-3SG.PRS
‘She must not.’ (¬ > epistemic □)

When the modal complement doesn’t contain an overt biti ‘be.INF’, the string can be analyzed as containing its silent version, or as in (74).

Mora-∅ da djeca, t. jedu povrće
(must-3SG.PRS DA children eat vegetables
‘The children must eat the vegetables.’
(epistemic)

T
ModP
Mod CP
mora C
da djeca jedu povrće

TP2

TP1
On this analysis, MCE should not be available with epistemic modal verbs, as CP ellipsis is not available (65b) and (66b). If the modal embeds a vP instead, headed by optionally covert be, I cannot explain why MCE is not possible with epistemic modals in BCS, but the same problem exists for all analyses I am aware of.

Like the facts about NPIs and negation, the difference in the availability of MCE depending on the modal flavor suggests the existence of a structural difference between epistemic and root interpretations of modal verbs. I have also shown that the complement of epistemic modals in BCS optionally contains at least one element, the infinitival biti ‘be’, which is not contained in the complement of root modals. It is unclear how such an element would fit into the structures such as (75) proposed by Brennan (1993); Cinque (1999); Hacquard (2006, 2010).

Additionally, as TP ellipsis is available, it is unclear how this structure would account for the contrast between (67) and (73).

The unavailability of CP ellipsis, combined with the biclausal analysis of epistemic interpretation of modal verbs, can account for the contrast presented here. Additionally, the analysis I offer accounts for the facts about negation and NPI licensing I have shown in this section in a way that analyses under which epistemic modals are merged above T cannot. The following section presents additional evidence in support of my argument, before moving on to discussing the details of the analysis in §2.5.

53
2.4 Additional arguments

As discussed in §2.2, the BCS modals *must* and *can* are verbal elements, and therefore should be examined as such, comparing their behavior to that of their non-modal counterparts. As verbal elements, they bear tense, aspect and agreement (TAM) morphology. This section probes into the distinguishing characteristics of their epistemic and root flavors, in particular how they differ based on word order and TAM morphology. The facts I present here are fully compatible and straightforwardly follow from the analysis I presented above, although they are not incompatible with many other analyses, including Brennan (1993); Cinque (1999); Drubig (2001); Hacquard (2006, 2010) and others. For this reason, I refer to them as ‘weak arguments’ for my analysis. However, the arguments presented in the previous section should be sufficient to rule out the other analyses, as they cannot account for the BCS data in ways in which a biclausal, CP-embedding analysis of epistemic uses of modal verbs can.

2.4.1 Word order

The word order in BCS is quite free, and scrambling is available. However, the default word order is SVO. While the language is pro-drop, a phonologically present subject precedes the verb in simple declarative sentences. With the necessity modal verb *morati* ‘must’, the SVO word order strongly suggests root interpretations in out-of-the-blue contexts. Consider (36), repeated here as (76). In a neutral context, the strongest reading available for this sentence is deontic. This is not to say that an epistemic reading is not available, it just requires some context. For example, if I am asked about all of my friends’ whereabouts, and in my answer I mention everyone except for Ana, my interlocutor can ask ‘and what about Ana?’ In this context, I can say (76).
Imagine, on the other hand, that I am sitting in the park with a friend and we see that the lights are on in the library, and I know that that’s the study room Ana usually uses. My friend could ask me ‘why do you think the lights are on this late on a Friday night?’ In that context, (76) is infelicitous. Instead, I would say (77).

(76) Ana mora-∅ da uči-∅.
Ana must-3SG.NSG DA study-3SG.NSG
‘Ana must study.’ OR ‘Ana must be studying’

(77) Mora-∅ da Ana uči-∅.
must-3SG.NSG DA Ana study-3SG.NSG
‘Ana must be studying’ (□ epistemic, deontic)

Compared to (77), which has a neutral word order for epistemic interpretations of the modal verb morati ‘must’, the subject in (76) is interpreted as Topic. (See Werkmann (2007), and Chapter 3 here for a discussion of similar facts in Bulgarian and Macedonian.)

When the possibility modal moći ‘can’ is used following the subject, as in (78), only a deontic interpretation is available (cf. the ambiguous (76) for morati ‘must’). This is due to the fact that, for many speakers, the epistemic reading of moći ‘can’ is always accompanied by the infinitival form of biti ‘be’, shown in (79).16

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16As will be discussed in Chapter 5, this is true of speakers from Sarajevo, who strongly prefer epistemic use of the possibility modal verb moći ‘can’ to be followed with infinitival biti ‘be’. However, some data points exist on the internet suggesting that, at least for some speakers, this is as optional as the use of biti after the epistemic necessity modal.

(i) Misli-m da se mjesto zvalo Sjeverin. No može da je bi-lo i više otmica, ne zna-m.
‘I think the place (from which people were kidnapped) was called Sjeverin. But I don’t know.’
(78) Ana može-∅ da uči-∅.
Ana can-3SG.PRS DA study-3SG.PRS
‘Ana can study.’ (◆ deontic, ??epistemic)

(79) Može-∅ *(bi-ti) da Ana uči-∅.
can-3SG.PRS be-INF DA Ana study-3SG.PRS
‘Ana may be studying’ (□ epistemic, #deontic)

Topicalizing the subject across the epistemic modal is possible (80), but this does not create an ambiguous utterance such as the one in (76), as the presence of *biti ‘be’ following the modal verb disambiguates between the modal flavors. Thus, in many dialects, modal flavor ambiguity is only possible with the necessity modal verb, as in (76).

Furthermore, the use of moći in epistemic contexts is on the decline. Synchronically, most speakers express epistemic possibility through the use of the adverb možda ‘maybe’, decomposable into može+da. Musić (1900: 40, fn.2) states (translation mine): “Here I ought to mention that I do not think that možda is short for može biti da, as Vuk [Stefanović Karadžić (1852), D.V.] states […], but I hold it became like this. First it was said, e.g. mogu da znam, možeš da znaš, može da zna etc. [can.1SG DA know.1SG; 2SG, 3SG, emphasis mine, D.V.] to mean može biti da znam, može biti da znaš [can.1SG be-INF DA know.1SG; 2SG, emphasis mine, D.V.] etc., and then the form of third person singular može (= može biti) started to be used, regardless of what singular or plural person the verb of the sentence with da was (so: može da znam, može da znaš, može da znaju), and from može da there became možda […]. And beside that the phrase became: može biti da znam, može biti da znaš etc.” Musić (1900) also gives examples of the use of može da parallel with the adverb možda, as well as the use of contracted mož’ da:

(ii) Prilikom konekcije može da si ti sve podesio kako valja, ali da kabli ne valja. during connecting can.3SG DA be.2SG you all adjusted how is-good but DA cable NEG is-good. ‘When connecting, it’s possible that you have adjusted everything properly, but that the cable is wrong.’
(from: https://www.sk.rs/forum/archive/index.php/t-75090.html)

(iii) Može da si našao devojku, pak mu ide-š, nosi-š svadbarinu; a možda si jedinc u can DA are found girl so him go-2SG carry-2SG bride-price and maybe are only-son in majke, pa ćeš, brate, tamo poginuti. mother so will.2SG brother VOC there get-killed ‘You may have found a girl, so you go to him carrying the bride price, and maybe you are your mother’s only son, so you will die there, brother.’

(iv) Vodi me sestri Ivinoj, ne bi l’ je mladu video, mož’ da će po-ći na susret. lead me sister.DAT Ivo’s NEG be Q her young see, can.3SG.PRS DA will go-INF on meeting ‘Take me to Ivo’s sister, so I would perhaps see her young (face), she may go to the meeting.’
Although epistemic interpretations of the necessity modal *morati* 'must' are not obligatorily followed by *biti* 'be-INF', all epistemically interpreted sentences containing *morati* are equally acceptable with *biti* following the modal. Additionally, some speakers I have consulted prefer the presence of *biti* following the modal (81) to sentences that do not contain *biti* in epistemic contexts (77).  

(81) Mora-∅ bi-ti da Ana uči-∅.
    'Ana must be studying' (□ epistemic, #deontic)

The fact that the default word order is to have the subject following the modal verb for epistemic interpretations, but preceding it for root ones, follows straightforwardly from the analysis I propose here. Epistemic interpretations are derived from (82), from which it follows that, unless it moves out of the embedded CP via topicalization, the subject will follow the modal verb.

(82)

17See Chapter 5 for a quantitative analysis of modal verb use in epistemic and root contexts.
In root interpretations, there is only one clause. The subject raises to Spec,TP and thus precedes the modal verb (83).

(83) Ana
Nom mora-∅ da t;uči-∅
Ana.NOM must-3SG.PRS DA study.IP-3SG.PRS
‘Ana must study.’

2.4.2 Aspect

As shown in previous sections, certain constructions with the necessity modal morati ‘must’ can be ambiguous between a root interpretation and an epistemic one in which the subject has been topicalized. Crucially, however, this is only possible in a limited number of cases. One of the elements conditioning whether or not ambiguity is possible is aspectual morphology on the verb embedded under the modal.

As a reminder, note that in §2.1.3 I showed that multiple elements in the same TP can bear aspectual morphology, and that we need to posit multiple Asp projections, as elements in the same TP can be marked with different aspects. Additionally, note that
in §2.1.1 I showed that perfective verbs can only be used in present tense if they have a clausemate licensor, and in §2.1.2 I have shown that the Mood $da_2$, but not the C $da_1$ licenses such use. Finally, note that the modal verbs I am discussing here, moči ‘can’ and morati ‘must’ only have imperfective forms §2.2. Due to this, they are used in a periphrastic combination of the auxiliary biti ‘be’ marked perfective with the modal verb in participle form when perfective is required (as in, for example, conditional clauses).

Let us restate that sentences with a necessity modal verb morati are ambiguous between root interpretations and an epistemic interpretation with the subject topicalized, as in (84a). The embedded verb is imperfective, which is a form that is licensed in independent declaratives. On a deontic interpretation, this means that Ana must read for an unspecified amount of time. There is no obligation for Ana to finish the book. If we want to convey that Ana must read *The Trial* all the way through, the embedded imperfective verb čitati becomes the perfective pročitati (84b).

(84) a. Ana mora-∅ da čita-∅ Proces. Ana must-3SG.PRS DA read.IPF-3SG.PRS process ‘Ana must read *The Trial.*’ (□ deontic, epistemic)

b. Ana mora-∅ da pro-čita-∅ Proces. Ana must-3SG.PRS DA PFV-read-3SG.PRS process ‘Ana must read *The Trial.*’ (□ deontic, #epistemic)

Crucially, (84b) cannot be used in epistemic contexts. In this sense, deontic interpretations of morati pattern with verbs like željeti ‘want’ as shown in §2.1.2. Both perfective and imperfective forms of embedded verbs are possible under deontic interpretations of modal verbs and under verbs like željeti ‘want’, (85a) and (85b). As with the deontic modal, the interpretation of (85b) is that Ana wants to read *The Trial* all the way through. The imperfective on the verb embedded under ‘want’ conveys either an irrealis statement...
(Ana wants to be reading The Trial (as opposed to doing whatever it is that she is doing)) or a future-oriented one (Ana wants to be reading The Trial all day tomorrow).

(85)  
\begin{align*}
\text{a. } & \text{Ana želi-∅ da čita-∅ Proces.} \\
& \text{Ana want.IPF-3SG.PRS DA₂ read.IPF-3SG.PRS process} \\
& \text{‘Ana wants to be reading The Trial.’}
\end{align*}

\begin{align*}
\text{b. } & \text{Ana želi-∅ da pro-čita-∅ Proces.} \\
& \text{Ana want.IPF-3SG.PRS DA₂ PFV-read-3SG.PRS process} \\
& \text{‘Ana wants to read The Trial.’}
\end{align*}

Epistemic interpretations of morati ‘must’, on the other hand, pattern with CP-embedding verbs like misli ‘think’, as shown in §2.1.2. These verbs only allow imperfective verbs to be embedded under them, with perfective forms resulting in ungrammaticality. Compare the grammatical (86a) to (86b) which is ungrammatical on the intended reading (cf. §2.1.2). Just as epistemic interpretations of (84b) are not available, (86b) is uninterpretable.

(86)  
\begin{align*}
\text{a. } & \text{Ana misli-∅ da čita-∅ Proces.} \\
& \text{Ana think.IPF-3SG.PRS DA₂ read.IPF-3SG.PRS process} \\
& \text{‘Ana thinks she is reading The Trial.’}
\end{align*}

\begin{align*}
\text{b. } & \text{*Ana misli-∅ da pro-čita-∅ Proces.} \\
& \text{Ana think.IPF-3SG.PRS DA₂ PFV-read-3SG.PRS process} \\
& \text{INTENDED: ‘Ana thinks she reads The Trial.’}
\end{align*}

Both the epistemic interpretation of (84b), and the sentence in (86b) can be repaired with the strategy used in §2.1.2, namely adding a licensor for the perfective form of the embedded verb. This is shown for morati in (87), which can have either a deontic meaning (it is Ana’s duty as the head of the Kafka club to read The Trial every year) or an epistemic one (her copy of The Trial is barely holding together, and she takes good care of her books generally, plus she often makes reference to it in conversation).
(87) Ana mora-∅ da pro-čita-∅ Proces svake godine.
Ana must-3SG.PRS DA PFV-read-3SG.PRS process every year
‘Ana must read \textit{The Trial} every year.’ □ deontic, epistemic

All the facts in this subsection also apply to the possibility modal verb \textit{moći} ‘can’ in terms of licensing the use of perfective form – when the embedded verb is perfective and used in the present, only root interpretations are available. This, again, follows straightforwardly from my analysis. If the Mood head $da_2$ licenses the use of present perfective, then the availability of root interpretations is expected. On the other hand, without an additional licensor in the embedded CP, present perfective is not licit in a syntactic environment such as (88), from which it follows that sentences such as (86b) are ungrammatical.

(88)

\begin{tikzpicture}
  \node (TP1) {TP_1}
  \node (T1) [below of=TP1] {T_1}
  \node (ModP) [below of=T1] {ModP}
  \node (Mod) [below of=ModP] {Mod}
  \node (CP) [below of=Mod] {CP}
  \node (mora) [below of=Mod] {mora}
  \node (C) [below of=CP] {C}
  \node (da) [below of=C] {da}
  \node (TP2) [below of=C] {TP_2}
  \path (TP1) -- (T1) -- (ModP) -- (Mod) -- (CP) -- (mora) -- (C) -- (da) -- (TP2);
  \node at (TP1-|ModP-|TP2) {Ana pročita Proces};
\end{tikzpicture}

\textbf{2.4.3 Tense}

As stated in §2.2, the BCS modal verbs discussed here being verbal elements results in the availability of tense morphology on the modal itself. In the previous section I have shown that both root and epistemic interpretations are available when both the modal and the main verb are imperfective and bear present tense morphology. In this section I discuss how either the modal or the embedded verb bearing different tense morphology can disambiguate between root and epistemic interpretations. I show that both root and epistemic modal verbs can bear tense morphology, and argue that this is because each of
them is the highest verbal element merged below a Tense head. Additionally, I show that
the embedded verb can bear tense morphology when embedded under epistemic uses
of the modal verb. Under root uses, however, the embedded verb can only bear present
tense. This, I argue, is due to the fact that epistemic modal constructions are biclausal and
have two Tense phrases, while root modal constructions are monoclausal and only have
one Tense head, the features of which get spelled out on the modal itself. Due to this, in
root contexts the tense on the modal corresponds to the time of the event of the embedded
verb, which is not the case in epistemic contexts.

In the constructions discussed in this dissertation, there are two items that can bear
tense morphology: the modal verb and the verb embedded under it. So far, I have mostly
examined the cases in which they both bear present tense morphology. Constructions in
which both agree with the subject and bear future (89a) or past (89b) tense morphology
are ungrammatical.

      Ana will.3SG.PRS.CL must-INF DA will.3SG.PRS.CL read-INF process
      INTENDED: ‘Ana will have to read *The Trial.’

b. *Ana je mora-la da je čita-la
      Ana be.IPF.3SG.PRS.CL must-PPT.F.SG DA be.IPF.3SG.PRS.CL read-PPT.F.SG
      Proces.
      process
      INTENDED: ‘Ana had to read *The Trial.’

Here I want to discuss the grammatical cases – those in which either the modal or the
main verb is marked for present, while the other is marked with either past or future
tense morphology. In these cases, no ambiguity remains – if the modal agrees with the
subject and bears tense morphology other than the present, only root interpretations are
available, for both the necessity (90) and the possibility (91) modal verb.
Note that I have kept the aspectual morphology on the embedded verb imperfective in all the sentences in (90) and (91) to exclude the possibility that aspect is what blocks the epistemic interpretation here. The key point here is that the embedded present is not interpreted as present – (91a) does not mean ‘Ana will, in the future, be obliged to read The Trial in the present’. I return to this shortly.

As with negation, epistemic interpretations can surface with tense-marked modal verbs in the presence of the infinitival biti ‘be’. Note that future morphology on the epistemic interpretation of the modal verb (92a) does not mean ‘Based on what I know, in the future it will necessarily be the case that Ana is reading The Trial’ or ‘Based on what I will know in the future, it will necessarily be the case that Ana is reading The Trial’. Rather, the future morphology seems to merely be contributing to the epistemic necessity interpretation.
This is similar to what Giannakidou & Mari (2017) show for Greek sentences such as (93a), where the future marker *tha* is interpreted as epistemic, and its co-occurrence with the epistemic modal *prepi* (93b) is interpreted as modal concord.

(93) a. I Ariadne tha milise xthes.  
   the Ariadne FUT talk.3SG.PST yesterday.  
   ‘Ariadne must have spoken yesterday.’ Giannakidou & Mari (2017: 10 (40a))

   b. I Ariadne tha prepi na milise xthes...  
   the Ariadne FUT must SBJV talk.3SG.PST yesterday  
   ‘Ariadne must have spoken yesterday’ Giannakidou & Mari (2017: 11 (47))

The epistemicity of future in (92a) is further evidenced by the fact that, just like in (93a), epistemic necessity in BCS can be expressed by future alone. For example, (94) does not mean that Ana will be reading *The Trial* in the future, but rather that the speaker inferred that Ana is reading it.

(94) Bit će da Ana čita-∅  
    Proces.  
    be.INF will.3SG.PRS.CL DA Ana read.IPF-3SG.PRS process  
    ‘Ana will be reading *The Trial.*’ (□ epistemic)

On the other hand, while epistemic interpretations for past tense on the modal (92b) are not easy to grasp, they are not impossible. For example, (92b) means ‘*Based on what I know or knew, at a past point in time being discussed, it was necessarily the case that Ana was reading The Trial*’. The past tense epistemic reading is also available for the possibility modal (95a), but the future is not (95b).

(95) a. Mog-lo je bi-ti da Ana čita-∅  
    Proces.  
    can-PPT.N.SG be.IPF.3SG.PRS.CL be-INF DA Ana read.IPF-3SG.PRS process  
    ‘Ana could have been reading *The Trial*’ (⋄ epistemic, #deontic)
b. *Moči će bi-ti da Ana čita-∅

INTENDED: ‘It will be possible that Ana is reading The Trial’

Importantly, as will be discussed in more detail in the following section, the modal in these epistemic interpretations fails to agree with the subject – note that in both (95a) and (92b) the modal shows N.SG agreement despite the fact that the subject is feminine. I will return to this later.

The present tense on the verb embedded under the root modal is interpreted as dependent: the use of temporal adverbs with deontic modals is restricted by the tense morphology on the modal (not the embedded present), whereas the use of temporal adverbs with epistemics is restricted by tense morphology on the embedded verb. To illustrate, observe (96a), where the embedded verb is marked future (will + infinitive), and the modal bears present tense morphology. In this environment, only future temporal adverbs can be used, as it involves a current assessment of probabilities about a future event: (96a) is felicitous in a context where I know that Ana and Ena share a copy of The Trial and are both reading it, and I see that Ena packed a different book for school tomorrow, and is currently reading The Trial. If the embedded verb is marked present (96b), past temporal adverbs cannot be used, and future ones are only grammatical on a present-as-future reading. Thus, if sutra ‘tomorrow’ is used in (96b), its interpretation is the same as the one I just described for (96a). With trenutno ‘currently’, (96b) is felicitous in a context where we see Ena reading something other than The Trial and are speculating as to why she isn’t reading The Trial. If the embedded verb is marked for past (auxiliary be + past participle), only past temporal adverbs can be used (96c), as we are only making inferences about what Ana was doing at a previous time.
(96)  a. Mora-∅   da  će  Ana (*jučer/*trenutno/sutra)  
must-3SG.PRS DA will.3SG.PRS.CL Ana (yesterday/currently/tomorrow)  
čita-ti      Proces.  
read.IPF-INF process  
‘It must be that Ana will be reading The Trial  
(*yesterday/*currently/tomorrow)’  
(□ epistemic, #deontic)  

b. Mora-∅   da  Ana (*jučer/trenutno/sutra)  čita-∅  
must-3SG.PRS DA Ana (*yesterday/currently/tomorrow) read.IPF-3SG.PRS  
Proces.  
process  
‘Ana must be (*yesterday/currently/tomorrow) reading The Trial.’  
(□ epistemic, #deontic)  

c. Mora-∅   da  je   Ana (jučer/*trenutno/*sutra)  
must-INF DA be.3SG.PRS.CL Ana (yesterday/currently/tomorrow)  
čita-la    Proces.  
read.IPF-PPT.F.SG process  
‘Ana must have been reading The Trial (yesterday/*currently/*tomorrow)’  
(□ epistemic, #deontic)  

When the modal bears tense morphology and agrees with the subject, the availability of 
the temporal adverbs depends on the tense morphology on the modal, as the tense on the 
embedded verb is held constant (and in some dialects, instead of tense-marked embedded 
verbs, infinitives are used). See (97a), where the modal bears future morphology and the 
sentence is interpreted as Tomorrow, Ana will have the obligation to read The Trial. Future-
orientedness is possible when the modal bears present morphology as well (97b), but this 
is due to a combination of the deontic meaning and the type of event.\(^{18}\) Crucially, only 
present morphology on the modal allows for use of present temporal adverbs such as 
trenutno ‘currently’ (97b), as opposed to either future (97a) or past (97c). The latter only 
allows for past temporal adverbs, as it discusses past necessities. 

\(^{18}\)This disappears on a circumstantial reading, for example. In discussing future events, let’s say a lecture 
during which Ana will fall asleep, which we will find funny, we can say (i) but not (ii).
The fact that modal verbs can bear tense morphology on both interpretations is derivable from my analysis, as both epistemic and root modal verbs are the highest verbal elements merged below T. Additionally, my analysis predicts that tense morphology on the root modal correlates with the time of the event of the embedded verb, whereas tense morphology on the epistemic modal does not. This was shown to hold in (96). The modal merged in the same TP as the verb it embeds will bear the only tense morphology in that TP. Epistemically interpreted modal verbs are not part of the same TP as the verbs embedded under them, and can bear tense morphology unrelated to that on the embedded verb. For example, note the derivation of (98).

(i) Ja ću sutra mora-ti da se nasmije-m.
I will.1SG.PRS.CL tomorrow must-INF DA SE laugh-1SG.PRS
‘I will have to laugh tomorrow (i.e. I will have no choice but to laugh.)’

(ii) *Ja sutra moram da se nasmijem.
I tomorrow must-1SG.PRS DA SE laugh-1SG.PRS
INTENDED: ‘I will have to laugh tomorrow (i.e. I will have no choice but to laugh.)’
The modal in TP₂ bears future tense – I marked that on T, but I have the morphologically complex moraće, a product of the clitic form of will fusing with the infinitive, in the Mod head. I make no proposal here as to where will merges – either as T, or as a head.
of a functional projection below Mod. Similarly for the clitic in the embedded TP, I have it move to head of CIP (clitic phrase, as per Sportiche (1996)) from its position in T, where it moved from Asp (as freestanding Asp moves to T, see §2.1.3). These choices are not crucial.

What is crucial is that TP₂ is \([\text{fut}]\), whereas TP₁ is \([\text{pst}]\). Tense morphology on the root modal, in the same TP as the event of Ana’s bookreading, necessarily correlates with the time of the event. From this it follows that the event of Ana’s bookreading can only be modified by past temporal adverbs. As the modal in TP₂ is not part of the same most local TP as the AspP containing the bookreading event, it can bear tense morphology unrelated to the event time.

I have mentioned throughout this section that non-present tense agreeing morphology on the modal is compatible with only root interpretations – the following section expounds on that, and explains how this as well follows from my analysis.

### 2.4.4 Agreement

As stated in §2.2, BCS modal verbs can show agreement with the subject. To allow the reader to focus on other arguments I presented in this chapter, I held the subject \(\phi\)-features constant at 3SG in the previous sections. This obscured, for the most part, the fact that epistemic modals fail to agree, always bearing the default features, 3SG in present and future, and N.SG in participle forms. This is true of both the necessity and the possibility modals. The sentences in (99), where both the modal and the embedded verb agree with the subject, can only have root interpretations.

(99) a. Djevojčic-e mora-ju da čita-ju.
    girls must-3PL.PRS DA read-3PL.PRS
    ‘The girls must read.’ (□ deontic, #epistemic)
b. Djevojčic-e mògů da čita-ju.
girls can.3PL.PRS DA read-3PL.PRS
‘The girls can read.’ (○ deontic, #epistemic)

The reverse is not possible in BCS – the embedded verb can be infinitive and in that sense not agree with the subject (this yields root interpretations as well) – but it is not possible for the embedded verb to bear φ-features that do not match those of the subject (101). It is also, unsurprisingly, not possible for no verbal element to agree with the subject (102).

girls must-3SG.PRS be-INF DA read-3SG.PRS
INTENDED: ‘The girls must read.’ (□ deontic, #epistemic)

girls can.3PL.PRS DA read-3SG.PRS
INTENDED: ‘The girls can read.’ (○ deontic, #epistemic)

girls must-3SG.PRS DA read-3SG.PRS
INTENDED: ‘The girls must read.’ (□ deontic, #epistemic)

girls can-3SG.PRS be-INF DA read-3SG.PRS
INTENDED: ‘The girls can read.’ (○ deontic, #epistemic)
Based on the facts about BCS agreement, and the obligatory agreement of all verbal elements inside a TP with the subject (see §2.1.3), it is fully expected that modal verbs agree with the subject on their root interpretations. The cyclic A-movement of the subject through specifier positions of all verbal elements (AspP, ModP, TP) results in a syntactic relationship between the modal verb and the subject. From this it also follows (see Agreement principle, (21) in §2.1.3) that the embedded lexical verb, if it bears φ-features, shows agreement with the subject. Importantly, subject A-movement stops at TP, and any movement out of the CP the subject originates in is A’-movement. Thus the specifier position of modal verbs in higher CPs is not a landing site for the subject. From this it follows that modals interpreted epistemically will not enter into an Agree relation with the subject of the embedded verb, as is shown by the data in this section.

2.5 Analysis

As Kratzer’s (1977; 1981; 1991; 2013) work proposes, the ambiguity of a single lexical item between different modal flavors should be derivable from context, rather than being couched in lexical ambiguity of individual elements. Cinque (1999) observed cross-linguistically attested structural differences between epistemic and root modals and based on that posited at least two distinct functional categories; above T for epistemic, below T for root modals. Hacquard (2006, 2010) combines the insights of the two, and takes Kratzer’s analysis further. For Hacquard, modals are event-relative and can enter the derivation at two distinct positions – above VP or above TP. Above VP, modals are bound by Aspect which quantifies over the VP event. Above TP, they are bound by the speech event binder.

There are some issues that BCS, being an aspect-heavy language, poses for this type of analysis. Both modals and the verbs they embed are aspectually marked, and can
bear distinct aspectual morphology §2.1.3. I offer no solution, merely pointing to this as an issue to be resolved in future work.

Returning to the discussion of *da* from §2.1.2, we saw that *da* following verbs that take perfective future-oriented complements has been argued to be merged in Mod (Todorović & Wurmbrand, 2016). I follow Tomić (2004, 2006), who has argued that this *da* is merged in Mood. Similarly, for Greek *na*, which appears in parallel constructions and acts as a licensor for perfective non-past (the parallel to BCS present perfective), Giannakidou (2009) argued that it is a Mood head. As I have shown here that modal verbs with root interpretations syntactically pattern with such future-oriented verbs like željeti ‘want’, I argued that the particle *da* following such modals is a Mood head. The modal verb itself heads ModP, and the subject moves through its specifier position in cyclic A-movement of the type argued for by Carstens & Kinyalolo (1989), agreeing with the modal, as well as the embedded verb and any freestanding Asp heads.

In constructions where the embedded verb is infinitival, *da* does not appear – as expected per Todorović & Wurmbrand’s (2016) analysis, where *da* marks finiteness of a domain and can be merged as C (marking that the CP it heads is finite) or Mod/T, marking a finite ModP/TP. Within my analysis, *da*₂ marks subjunctive mood, but the key point here is that the complement of the root modal can be either subjunctive or infinitival. Infinitival complements are also available to epistemic modal verbs, which as shown in this chapter are either optionally or obligatorily followed by the infinitive form *biti* ‘be’. This verb is then followed by a clausal complement, a CP headed by *da*.

In this way, modal verbs can take the same complement type, a non-finite vP, regardless of their flavor. Their flavor is determined by the syntactic distance between the modal verb and the embedded event – the verbal complement of Mod in deontic interpretations is headed by the embedded lexical verb, whereas the verbal complement of Mod
in epistemic interpretations is headed by a functional *biti* ‘be’, and the modal is separated from the embedded lexical verb by a CP phasal boundary.

The positions of the modals being the same gives us a desirable uniform syntax. The epistemic uses of modal verbs, however, can perhaps also embed CPs directly (see §2.3.3) which I cannot account for at the time. The important distinctions between epistemic and root interpretations of modal verbs follow from the fact that the complement of Mod in root interpretations is headed by the embedded lexical verb. Being part of the TP most local to the embedded verb enables the modal to agree with the subject, interact with tense, accounts for why it takes scope under sentential negation, allows for vP ellipsis, and clarifies why NPIs are licensed in modal constructions with root interpretations.

On the other hand, the complement of Mod in epistemic constructions is either a CP or a vP headed by optionally covert *biti* ‘be’ which takes a CP complement containing the lexical verb. Epistemic modals cannot agree with the subject, due to a combination of two factors: CP being a phase, and the probe and the goal needing to be in all the same phases for agreement to be possible (Chomsky, 2001). Likewise, the tense morphology on the epistemic modal being distinct and unrelated to the tense on the embedded verb is predicted, as they are in two distinct TPs. The analysis provided here accounts for the fact that, generally, epistemic modals scope over sentential negation, but also for the fact that negation can scope over them. That such negation cannot license *ni*-NPIs is also accounted for, as a CP barrier exists between the modal and the vP that contains the lexical verb. For a detailed picture, let’s imagine a context in which me and my friend Ana went to see her sister’s very popular band play. After the show, Ana wanted to go and say hi to her, but the security guard told us that we are not allowed to go backstage. We later tell this story to Ana’s sister, and she says, shocked, that it can’t possibly be true that Ana wasn’t allowed backstage. This sentence, with two sentential negations and both epistemic and root uses of the possibility modal verb *moči* ‘can’ is shown in (103).
The exact position of negation is not crucial here, in terms of whether negation in BCS merges directly above TP, AspP or ModP. I assume that the freestanding aspect
morpheme moves through Neg on its way to T, yielding a complex nije out of Neg ne and Asp je. The subject moves through specifier positions of all verbal elements (see §2.1.3), stopping at Spec, TP. The lower modal agrees with the subject and scopes below Asp₂ and T. The higher modal scopes over the entire CP proposition.

This analysis is compatible with a Kratzerian semantics, where only one lexical entry exists for a modal verb, with the context determining its interpretation. At the same time, the analysis given here captures the modal verbs’ syntactic behavior as discussed in this chapter. Additionally, it delivers Hacquard’s (2010) split between root modals being relative to vP₁ event, and epistemic modals being relative to the speech event, as the epistemic modal in this configuration can only be relative to the speech event or vP₂.¹⁹

### 2.6 Conclusion

While the literature on the topic of modality from a semantic and philosophical perspective is vast, syntactic literature is comparatively very small. This chapter contributes to the syntactic discussion of the similarities and differences between epistemic and root modal flavors. The two types of modality are cross-linguistically expressed by the same modal elements, but often show distinct syntactic behavior. Previous syntactic accounts of the differences between the two, which have posited that epistemic modals take higher scope than root modals, fail to account for the behavior of BCS modal verbs morati ‘must’ and moći ‘can’. I have shown an array of syntactic diagnostics, the results of which all converge on the argument that epistemic modal constructions are biclausal. A summary is in Table 2.4 on the following page.

This allows us to maintain some of the previously noted facts – that, when interpreted epistemically, modal verbs take scope above tense, aspect and negation – while

¹⁹Chapter 3, following Soare (2009), discusses the possible semantics of biti ‘be’ which is heading vP₂ as a proposition stativizer.
<table>
<thead>
<tr>
<th>Diagnostic</th>
<th>Root readings</th>
<th>Epistemic readings</th>
</tr>
</thead>
<tbody>
<tr>
<td>□/◊ &gt; NEG</td>
<td>constituent NEG</td>
<td>sentential NEG</td>
</tr>
<tr>
<td>NEG &gt; □/◊</td>
<td>sentential NEG</td>
<td>sentential NEG</td>
</tr>
<tr>
<td><em>ni</em>-NPI licensed by NEG &gt; □/◊</td>
<td>YES</td>
<td>NO</td>
</tr>
<tr>
<td>YES</td>
<td>NO</td>
<td></td>
</tr>
<tr>
<td>Modal complement ellipsis</td>
<td>Subject’s</td>
<td>Default</td>
</tr>
<tr>
<td>Modal phi-features</td>
<td>PRS/PST/FUT</td>
<td>PRS/PST/FUT</td>
</tr>
<tr>
<td>Modal Tense morphology</td>
<td>PRS</td>
<td>PRS/PST/FUT</td>
</tr>
<tr>
<td>Complement Tense morphology</td>
<td>PFV or IPF</td>
<td>IPF (PFV if licensed)</td>
</tr>
<tr>
<td>Complement aspect</td>
<td>S-Mod-V</td>
<td>Mod-S-V</td>
</tr>
<tr>
<td>Default word order</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table 2.4** – Syntactic diagnostics

preserving the syntactic similarities between the modal flavors. On these assumptions, both root and epistemic modals can take infinitival or subjunctive MoodP complements. The distinctions stem from the differences in the size of that complement – modals are interpreted epistemically when a CP barrier intervenes between the modal and the lexical verb.

In this chapter, I have presented a number of arguments that show that a position above TP is not sufficient for BCS modal verbs to be interpreted epistemically, and that a CP-embedding structure is required. I do not intend to argue that this is the case for all languages. For the English modal auxiliaries *can* and *must*, I will assume a ‘raising’ analysis for both epistemic and root interpretations, which still differ in a crucial way. For root interpretations, the raising is trivial, as the complement of the modal is the aspectually marked verb phrase (AspP), which means that the subject merely moves to the specifier position of the TP it is generated in. For epistemic interpretations, the modal auxiliary acts more like a stereotypical raising verb, as argued by Ross (1969). This means that the modal complement is a non-finite TP the subject of which raises to the specifier position of the TP containing the modal. The following chapter discusses this in more detail.

In Chapter 3 I will discuss CP-embedding structures with modal verbs in other languages, ranging from those in which such structures are a necessary condition for
epistemic interpretations (BCS, Bulgarian, Macedonian, Romanian, Greek, Maltese, Moroccan Arabic, Hebrew) to those in which CP-embedding is not a necessary, but is a sufficient condition for yielding epistemic interpretations only (Russian, French, Spanish, Modern Standard Arabic). The chapters following that return to BCS, and more particularly to the question of how the syntax and semantics of modal verbs conditions child language learning of the constructions discussed here, in both production (Chapter 4) and in comprehension (Chapter 5) of different modal flavors.
3.0 Introduction

This chapter explores the syntax of constructions containing modal verbs in languages beyond BCS. The starting point is the observation from Chapter 2, where I have shown that BCS modal verbs only receive an epistemic interpretation in constructions in which a CP barrier separates the modal verb from the vP event the modal is embedding. It is not surprising that modal verbs embedding full CP propositions would get epistemic interpretations – this follows straightforwardly if epistemic modals express “propositional modality” Palmer (1986: i.a.). In this chapter, I will show that a CP barrier between the modal and the embedded verb is a sufficient condition for eliminating root readings of
otherwise ambiguous modal verbs, even in languages in which it is not a necessary condition for epistemic interpretations.

I examine the cross-linguistic validity of the analysis I proposed in the previous chapter, starting from the South Slavic languages, namely Macedonian and Bulgarian (§3.1). I show that Bulgarian and Macedonian largely pattern with BCS in ways in which the syntax distinguishes between epistemic and root interpretations. The key differences lie in modal verb grammaticalization and loss of multiple agreement, which enables non-agreeing forms to be interpreted as root in Macedonian and Bulgarian, whereas they are always epistemic in BCS. I then turn to the typology of modal verb syntax within the Slavic language family (§3.2), as discussed in Besters-Dilger et al. (2009). I show that, within Slavic languages, only the languages that allow for subjects to agree with multiple verbal elements in one TP (BCS, Bulgarian and Macedonian) require a CP barrier between the modal and the embedded verb to yield epistemic interpretations.

After that, I show that the same split is observed in the Romance language family (§3.3.1), where Romanian (§3.3.1.1) allows for agreement on both the modal verb and the verb embedded under it, and uses CP modal complements to yield epistemic interpretations when the modal complement agrees with the subject. In that, Romanian is like BCS, Macedonian and Bulgarian within the Slavic language family. I also show that, like Russian among Slavic languages, Spanish (§3.3.1.2) and French (§3.3.1.3) can use a CP-embedding strategy to express epistemic modality, and that such biclausal structures eliminate root interpretations of otherwise ambiguous modal verbs. I show that multiple agreement (i.e., subject φ-feature agreement on both the modal verb and the embedded verb) yields root, but not epistemic interpretations in Greek (§3.3.2) as well. Finally, I show that this is not a quirk of the Balkan Sprachbund – the same is true in Semitic languages (§3.3.3), Modern Standard Arabic being a representative of a language that behaves like French and Spanish in only optionally using this strategy. Within Semitic lan-
guages, I show that Maltese, Moroccan Arabic, and Hebrew all require agreement on the modal in root-compatible contexts, but not when the modal is interpreted as epistemic. The basic facts (somewhat simplified) are summarized in Table 3.1.

<table>
<thead>
<tr>
<th>Root contexts</th>
<th>Epistemic contexts</th>
<th>Modal verbs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Modal Complement</td>
<td></td>
</tr>
<tr>
<td>Type A</td>
<td>+AGR +FIN</td>
<td>-AGR CP (obligatory)</td>
</tr>
<tr>
<td>Type A'</td>
<td>-AGR +FIN</td>
<td>-AGR +FIN, (optionally CP)</td>
</tr>
<tr>
<td>Type B</td>
<td>+AGR -FIN</td>
<td>+AGR -FIN (optionally CP)</td>
</tr>
<tr>
<td>Type B'</td>
<td>-AGR -FIN</td>
<td>-AGR -FIN (optionally CP)</td>
</tr>
</tbody>
</table>

- **Possibility:** BCS moči; Macedonian može; Bulgarian moga; Romanian *a putea*; Greek boro; Maltese seta
- **Necessity:** BCS morati, Macedonian mora

| Type A | Modal Complement | -AGR +FIN, (optionally CP) | Romanian *a putea*; M.S.Arabic yumkin
| Type A' | -AGR +FIN | -AGR +FIN, (optionally CP) | Macedonian mora; Bulgarian trjabva; Romanian a trebui; Greek prepi
| Type B | +AGR -FIN | +AGR -FIN (optionally CP) | Russian moč; Polish móć; Czech moct; Romanian *a putea*; French pouvoir; Spanish poder; Hebrew yaxol**
| Type B' | -AGR -FIN | -AGR -FIN (optionally CP) | English must, can

**Table 3.1** – Modal verb typology. Types A' and B' are grammaticalized variants of Types A and B, respectively. * – *a putea* can be used as either type. ** – for yaxol, CP complements are obligatory.
Furthermore, like the BCS moći ‘can’, I show that modal verbs in many of these languages require an infinitival be to follow them in epistemic uses. This way, I provide cross-linguistic support for Soare’s (2009) proposal that complements of epistemic modal verbs are propositions stativized by be. I propose that syntactic agreement on the modal, in those languages where it is not the only element that bears subject agreement, eliminates epistemic readings. I conclude by discussing directions for future research in §3.4.

3.1 Macedonian and Bulgarian

This section presents the facts about modal verbs in Macedonian and Bulgarian, South Slavic languages closely related to BCS, yet distinct in a number of ways (see, e.g., Tomić (2006)). Before discussing the modal verbs themselves, I will briefly present the facts about agreement in these languages in §3.1.1, parallel to §2.1.3 in Chapter 2. These facts are central for my argument, as they show that multiple verbal elements bearing person agreement, once fully available in both Bulgarian and Macedonian, is disappearing due to grammaticalization of the future marker. Then I present the modal verbs, focusing again on those which can have either root or epistemic interpretations (§3.1.2). Finally, in §3.1.3 I show that the analysis I offered for BCS in Chapter 2 captures the Macedonian and Bulgarian data, with an important caveat – modal verbs in these languages are going through the same grammaticalization process that the future marker underwent in Macedonian and, to a lesser extent, Bulgarian.

3.1.1 No multiple person agreement

Recall from Chapter 2 that BCS allows for agreement with multiple verbal elements in one TP when one of the elements is a participle. The same is true for both Macedonian and Bulgarian, which allow for agreement with both an auxiliary be and an l-participle, or a
passive participle\(^1\) in a single TP. This is the type of multiple agreement that Baker (2008) acknowledges exists in Indo-European languages. The lexical verb is an adjective-like element that agrees with the subject in gender and number, but not in person features. This is shown below, in (104a) (Macedonian) and (104b) (Bulgarian) for the \(l\)-participle, and in (105a) (Macedonian) and (105b) (Bulgarian) for the passive participle.

\[
(104) \quad \begin{align*}
\text{a. Sum & doš-la da si pozboruvame} \\
\text{be.1SG.PRS come-F.SG.L-PART DA DAT.REFL.CL talk.1PL.REPET} \\
\text{‘I have come to have a word with you.’} \quad \text{(Tomić, 2006: 341 (1c))}
\end{align*}
\]

\[
\begin{align*}
\text{b. Tja e vze-la parite.} \\
\text{she be.3SG take-F.SG.INDIC.L-PART money} \\
\text{‘She got the money.’} \quad \text{(Tomić, 2006: 461 (92a))}
\end{align*}
\]

\[
(105) \quad \begin{align*}
\text{a. Bev & dojde-na da si pozboruvame.} \\
\text{be.1SG.PST come-F.SG.PASS-PART DA DAT.REFL.CL talk.1PL.REPET} \\
\text{‘I had come to talk to you.’} \quad \text{(Tomić, 2006: 346 (8b))}
\end{align*}
\]

\[
\begin{align*}
\text{b. Ne & iskam da bāde-š razniš-te-n.} \\
\text{NEG want.1SG DA be₂-2SG dismissed-M.SG.PASS.PART} \\
\text{‘I don’t want you to be dismissed.’} \quad \text{(Tomić, 2006: 462 (92a))}
\end{align*}
\]

However, unlike in the dialects of BCS standard in Serbia and Bosnia, the future clitics in Macedonian are invariant and do not show agreement with the subject, although they historically used to (Tomić, 2004, 2006). As is the case in the BCS dialects spoken in South-eastern Serbia (see §2.1.3 in Chapter 2), the future marker is fully grammaticalized in Macedonian and no compound tenses exhibit multiple person agreement. The remnant of the Old Slavonic 3SG form of will has grammaticalized as an invariant future clitic \(\acute{\text{ke}}\), shown in (106a–c).

---

\(^1\)As in Chapter 2, I am using the terminology standard in the formal linguistics literature on Slavic languages (Tomić, 2006; Migdalski, 2006), instead of referring to these forms by the traditional term ‘verbal adjectives’. To reiterate, \(l\)-participles are formed by adding the \(l\) suffix to verbal bases, and inflect for gender and number, morphologically being similar to BCS \(l\)-participles as described in §2.1.3 in Chapter 2.
(106) a. Jas ke go stora-m toa utre.
   I will 3SG.M.ACC.CL do.PFV-1SG.PRS that tomorrow
   ‘I will do that tomorrow.’
   Tomić (2004: 524 (13a))

b. Nie ke stugne-me utre.
   we will arrive.PFV-1PL.PRS tomorrow
   ‘We will arrive tomorrow.’
   Tomić (2004: 524 (13b))

c. Petar ke dojd-e utre.
   Petar will come.PFV-3SG.PRS tomorrow
   ‘Petar will come tomorrow.’
   Tomić (2004: 524 (13c))

Compare the invariant Macedonian forms (106a–c) to the agreeing forms in the BCS standard in Serbia and Bosnia (107a–c).

(107) a. To cu da u-radi-m sutra.
   that will.1SG.PRS.CL DA PFV-do-1SG.PRS tomorrow
   ‘I will do that tomorrow.’
   Tomić (2004: 519 (2a))

b. Mi ce-mo da stigne-mo sutra.
   we will.1PL.PRS.CL DA arrive-1PL.PRS tomorrow
   ‘We will arrive tomorrow.’
   Tomić (2004: 520 (2b))

c. Petar ce da dode sutra.
   Petar will.3SG.PRS.CL DA come.PFV-3PL.PRS tomorrow
   ‘Petar will come tomorrow.’
   Tomić (2004: 520 (2c))

Just as Macedonian did and BCS still does, Bulgarian has historically had an agreeing will auxiliary. An example of that is in (108).

(108) Az sta ti da edno oko.
   I will.1SG.AUX 2SG.DAT.CL give.INF a/one eye.
   ‘I will give you one eye!’
   (Tomić, 2006: 457 (84))

Synchronically however, only a non-agreeing šte ‘will’ exists in present tense (Tomić, 2006). This is shown in (109), and is the same situation as we have seen for Macedonian - a 3SG form of a verb derived from the Old Slavonic xoteti ‘will/want’ is used regard-
less of the subject’s φ-features. This is in contrast to BCS, where the clitic form of *htjeti* ‘will/want’ still shows person and number agreement.

(109) a. Šte ti četa utre.
will 2SG.DAT.CL read.1SG tomorrow
‘I will read to you tomorrow.’
(Tomić, 2006: 477 (125a))

b. Ako si tuk, šte dojde-š säs nas.
if 2SG be here will come.PFV.PRS-2SG with 1PL.ACC.CL
‘If you are here, you will come with us.’
(Tomić, 2006: 482 (140a))

However, unlike Macedonian which never shows multiple person agreement, Bulgarian uses agreeing forms of ‘will’ in future-in-the-past uses, where both ‘will’ and the main verb agree with the subject (110).

(110) a. Tja šteše da umre [...].
she would.3SG DA die.3SG.PFV.PRS
‘She was going to die.’
(Tomić, 2006: 478 (129a))

b. Kakva glupost štjax da kaža!
what-kind stupidity would.1SG DA say.1SG.PFV.PRS
‘What a stupid thing was I going to say!’ (Tomić, 2006: 479 (130d))

Synchronically, thus, Bulgarian has not completely grammaticalized the future clitic, and still exhibits multiple person agreement in some constructions. In this, the Bulgarian agreement patterns are between the BCS fully agreeing future clitic use of *htjeti* ‘will/want’ and the Macedonian fully grammaticalized future particle *ke*.

To derive these agreement patterns, the same analysis I offered in Chapter 2 works for Macedonian and Bulgarian, with an important caveat. At some point, diachronically, it became possible for the Tense head to be invariant and bear 3SG features whatever the subject φ-features are – this is the current state of affairs in certain dialects in Southeastern Serbia (Tomić (2004, 2006), Boban Arsenijević, p.c., and Jelena Stojković, p.c.). Thus, the
future marker is grammaticalized in the form that historically denoted 3SG.PRS, and the derivation of a simple future sentence in Macedonian is as shown in example (111) below.

(111) Nie ke stugneme.
     we will arrive-PFV.1PL.PRS
     ‘We will arrive.’ (Tomić, 2004: 524 (13b))

In the following section, I argue that Macedonian and Bulgarian modal verbs are undergoing the same grammaticalization process that the future particles have undergone. This, I argue, is what allows non-agreeing (3SG) forms of the modal verb to be interpreted as root, which is possible in Macedonian and Bulgarian, but impossible in BCS. In combination with my analysis of modal verb syntax, I show that this accounts fully for the distribution of interpretations of Macedonian modal verbs relative to their syntactic structures and surface forms.

I argue that multiple agreement, resulting from a strict enforcement of the Agreement Principle, repeated here as (112), forces all modal verbs within the same CP as the subject to be interpreted as root and requires that modals be merged in a superordinate CP in order to receive an epistemic interpretation.
For all $\alpha^*, \beta^*$, where $^* = \text{agreement for some class or } \phi$-feature, agreement on $\alpha$ may differ from that on $\beta$ only if $\alpha$ and $\beta$ occupy projections of distinct syntactic categories.

### 3.1.2 Modal verbs

Tomić (2002: 262) states that “Macedonian has five basic lexical modal verbs – saka ‘want’, moţe ‘can/may’, mora ‘must’, treba ‘should’ and ima ‘have (to)’, and two invariant modal auxiliaries – ke ‘will/shall’ and bi ‘would.’” Using the same definition of modal verbs I used in Chapter 2 for BCS, I will only be discussing moţe ‘can/may’, mora ‘must’ and treba ‘should’ here. Lexically, these verbs are all close counterparts of BCS moć ‘can/may’, morati ‘must’ and trebati ‘need’, but they exhibit some key differences.

The first difference is in the behavior of the Macedonian treba ‘should’. Much like in BCS, treba ‘need’ is a lexical verb which “occurs in constructions with Dat NP/DP complements”, (Tomić, 2006: fn.34). In the next section, I discuss Macedonian treba ‘should’ and Bulgarian and trjabva ‘must’, both of which are grammaticalized in ways similar to what I have shown for the future particles in §3.1.1.

#### 3.1.2.1 Grammaticalized lexical treba ‘need’ and trjabva ‘must’

When used as a modal verb, the Macedonian treba ‘should’ can have root or epistemic interpretations (Mitkovska et al., 2012), yet always bears default ‘impersonal’ morphology (Tomić, 2002). In Chapter 2 I have shown that its BCS counterpart can be interpreted as root when bearing default 3SG morphology – to my knowledge, the only such modal verb in BCS. Crucially, Macedonian treba never shows agreement morphology as a functional verb meaning ‘should’ (compare (113a) and (113b)), only as the lexical treba ‘need’ (113c)).
In this, the behavior of *treba* in BCS and Macedonian is parallel to the behavior of the future marker *ке/će* (Mac/BCS) ‘will/shall’ – the Macedonian variant bears no agreement morphology, whereas the BCS variant shows full agreement in some, but not all dialects.

The Bulgarian counterpart also exists as a lexical verb *trjabva*, ‘need’ which, as in BCS and Macedonian, takes subject-like dative experiencers.² Like other verbs that take subject-like dative experiencers, both the Macedonian *treba* and the Bulgarian *trjabva* show agreement with their nominative arguments. A sentence parallel to the Macedonian (113c) is in (114) below.

```
(114) Ne mi trjabva-š ti, Petko mi trjabva.
      neg 1SG.DAT.CL need-2SG you Petko 1SG.DAT.CL need.3SG
      ‘I do not need YOU, I need Petko.’
```

```
In Bulgarian, *trjabva* ‘must’ has a strong necessity meaning (parallel to BCS & Macedonian *mora* ‘must’, not *treba* ‘should’). Like the Macedonian *treba*, it is grammaticalized in its functional uses, and is in 3SG form regardless of φ-features on the subject (115).

²I refer to them as subject-like dative experiencers rather than dative experiencer subjects, borrowing the dichotomy from Sigurðsson (2004). I refer the reader to that paper for arguments in favor of such a dichotomy.
A sentence containing *trjabva* ‘must’ can be ambiguous between epistemic and root modality, as shown in (116), where Varley (2014) states that focus disambiguates the string – focus on the modal is necessary for a root interpretation.

(116) Petja *trjabva* da e v xol-a.  
Petja must DA be.3SG.PRS in living room-DEF.M  
‘Petya must be in the living room [I order/it is necessary].’  
‘Petya should be in the living room [I suppose/I infer].’ (Varley, 2014: 68 (43))

*Trjabva* ‘must’ can be used in epistemic or root contexts, and Margarita Dimitrova (p.c.) uses it equally in epistemic (117a), circumstantial (117b) and deontic contexts (117c).

(117) a. Tezi glavobolija *trjabva* da sa ot napreženie.  
these headaches must.3SG.PRS DA be.PRS.3PL from tension  
‘These headaches must be from tension.’ (other causes have been ruled out)

b. Izvinete, *trjabva* da kixna!  
sorry must.3SG.PRS DA sneeze.1SG.PRS  
‘I’m sorry, I must sneeze.’

c. Te *trjabva* da sa vnimatelni.  
they must.3SG.PRS DA be.3PL.PRS careful  
‘They must be careful.’ (while driving, according to the law)

As I have not analyzed the complex behavior of the BCS *trebati* ‘need’ in the previous chapter, I will not go into further details on its Macedonian counterpart, or on the Bulgarian *trjabva* ‘must’. However, the fact that these verbs, like the future particles, are grammaticalized in 3SG.PRS form on their functional reading, regardless of whether they are
interpreted as root or epistemic, will be important for the discussion of može ‘can/may’ and mora ‘must’ in Macedonian, as well as moga ‘can’ in Bulgarian. I will only discuss these three verbs, as they are the only ones fitting the definition I laid out in Chapter 2 – Bulgarian trjabva ‘must’ and Macedonian treba ‘should’ do not behave as verbs in those languages do (i.e., show subject agreement) when interpreted as functional modals.

3.1.2.2 ‘True’ modal verbs

The Macedonian može ‘can/may’ and mora ‘must’, and the Bulgarian moga ‘can’ only serve as functional modal verbs, parallel to BCS moći ‘can’ and morati ‘must’. They are verbs, in the sense of morphosyntactically behaving like other verbs in the language, and modal verbs in the sense that they semantically make reference to non-actual states and events. They, importantly, only select for one verbal/propositional argument, and are not involved in thematic relations with arguments that denote invididuals. (Besters-Dilger et al., 2009)

On the surface, sentences containing these modal verbs in Macedonian and Bulgarian look similar to their BCS counterparts. In both languages, the complement of the modal verb is a clause introduced by DA. I have shown in Chapter 2 that, in BCS, this particle acts as both a Mood particle (da$_2$) and a complementizer introducing indicative CPs (da$_1$). In Macedonian and Bulgarian, it appears to not be a complementizer (Rudin, 1983), having instead only the former function (Tomić, 2006: and references therein).

Looking first at mora ‘must’ in BCS and Macedonian, we see that the key distinction between the two uses of the verb in the two languages is the breadth of ambiguity. In (118) the modal verb may be interpreted as having either an epistemic or deontic flavor in either BCS (where it is ambiguous between agreeing 3SG, and default 3SG forms) or Macedonian (Tomić, 2002, 2006; Werkmann, 2007; Wiemer, 2014). In (119) the modal verb
is ambiguous in the same way in Macedonian (Tomić (2002, 2006); Wiemer (2014) but cf. Werkmann (2007)) but is only interpreted as epistemic in BCS (see Chapter 2).

(118) a. Ivan mora da usisa-va-∅ svaki dan.
   Ivan must DA vacuum-IPF-3SG.PRS every day
   ‘Ivan must vacuum every day.’
   (BCS, ambiguous)

   b. Ivan mora da usisuva sekoj den.
   Ivan must DA vacuum every day
   ‘Ivan must vacuum every day.’
   (Macedonian, ambiguous)

(119) a. Djeca mora da čita-ju.
   children must DA read-IPF-3PL.PRS
   ‘The children must be reading.’
   (BCS, epistemic only)

   b. Deca-ta mora da čita-at.
   children-DEF must DA read-3PL.PRS
   ‘The children must read.’
   (Macedonian, ambiguous)

On the other hand, when the modal and the embedded verb both show agreement with the subject and present tense morphology, the sentence is interpreted as root only in both BCS (see Chapter 2) and Macedonian (Werkmann, 2007). Compare, for example, (120a) (example mine) to (120b) (from Werkmann (2007: 458 (2))).

(120) a. Djeca mora-ju da čita-ju.
   children must-3PL DA read-3PL
   ‘The children must read.’
   (BCS, root only)

   b. Deca-ta mora-at da čita-at knigi.
   children-DEF must-3PL DA read-3PL books
   ‘The children must read books.’
   (Macedonian, root only)

Contrary to these claims, Wiemer (2014) states that agreeing forms can be interpreted as epistemic, but adds that there is a strong preference for deontic interpretations. However, Wiemer adds that modals bearing 1st or 2nd person agreement morphology rarely get
epistemic interpretations (and provides no data where they do), leaving us with only 3PL subjects as a testing ground for this claim.

Isabella Jordanoska (p.c.) and Ana Temelkova Šundoska (p.c.), when asked to provide appropriate modal sentences in epistemic contexts (based on Vander Klok’s (2014) questionnaire), provided no agreeing forms, except in cases where the modal itself is bearing what is traditionally referred to as *potencijal* ‘potential’ morphology, as in (121). When asked about appropriateness of sentences without *potencijal*, such as (120b), in epistemic contexts, they explicitly rejected them and said such sentences only have deontic interpretations.

(121) Bi mora-la da živeše na ova ulica.  
‘She probably lived in this street.’  
(Wiemer, 2014: 147 (35))

Returning to *potencijal* ‘potential’, sentences containing this form are used in conditionals and ‘concern as yet unrealized events, but the speaker conveys some doubt as to their realization’ (Tomić, 2006: 453). Thus the epistemic interpretation may be forced by the semantics of ‘potential’ morphology, rather than the syntax. Otherwise, only non-agreeing forms of modal verbs were used by my informants in epistemic contexts.

In this, Macedonian is consistent with BCS. Similar forms, also traditionally referred to as *potencijal* ‘potential’ or *kondicional* ‘conditional’ (Barić et al., 1997), can yield epistemic interpretations of agreeing forms in BCS. For example, some (but not all) speakers find (122) felicitous as part of a pair-list answer to the question such as ‘Where is everyone?’

(122) Djeca bi mora-la da čita-ju.  
‘The children would have to be reading.’  
(epistemic)
Such a sentence has a root-only strong necessity reading when embedded in a conditional (i.e. If the rules demanded that they do so, the children would have to read). It also, as predicted by Von Fintel & Iatridou (2008), has the weak necessity ought reading when not embedded – for speakers who accept such use of (122), it is perfectly acceptable to follow it with ali nije obavezno ‘but that isn’t obligatory’. This is also why (123) is infelicitous out of the blue (although fine if accompanied by something like da bismo izumrli kao vrsta, ‘for us to go extinct as a species’).

(123) #Svi ljudi bi mora-li da umr-u.
    all people be.AOR.3PL must-PPT.M.PL DA die-3PL.PRS
    ‘All people ought to die.’

I leave the problem of the interplay of conditional/potential morphology and modal flavor for future research, but want to emphasize here that this is an exception. The use of conditional morphology in non-conditional contexts left aside, agreeing forms of mora ‘must’ in Macedonian or BCS are not interpreted as epistemic.

Turning now to Macedonian može and Bulgarian moga, both ‘can’, we see a similar pattern – when the subject is 3SG, sentences containing moga ‘can’ are ambiguous between epistemic possibility and root possibility meanings, as shown by (124).

(124) a. Može da se vleze.
    can/may.IMPERS DA ACC.REFL.CL enter.IMPERS
1. ‘It is possible to enter.’
2. ‘One can enter.’
    (Macedonian, (Tomić, 2006: 426 (20b)))

b. Ne može da vleze.
    NEG can/may.3SG DA enter.PVF.3SG.PRS
1. ‘It is not possible for her/him to enter.’
2. ‘(S)he cannot enter.’
    (Bulgarian, (Tomić, 2006: 464 (96b)))
Tomić (2006) does not explicitly state that only root interpretations are available for agreeing forms of Macedonian može ‘can’, but does imply it with translations – compare (125a) with (125b). The same is true for Bulgarian – compare (124b) to (126).

(125)  

a. Ne moževme *da go* vidime.  
\text{NEG} \text{can/be-able.1PL.IPF.PST} \text{DA} \text{3SG.M/N.ACC see.1PL.PFV.PRS}  
‘We couldn’t/were not able to see him/it.’  
(Tomić, 2006: 427 (21))

b. Može *da dojdat/dojdete.*  
\text{can/may.IMPERS} \text{DA come.3/2PL.PFV.PRS}  
1. ‘They/you can/may come.’  
2. ‘It is possible for them/you to come.’  
(Tomić, 2006: 426 (20))

(126) Ne moga *da í četa.*  
\text{NEG} \text{can/be-able.1SG} \text{DA} \text{3SG.F.DAT.CL read.1SG}  
‘I cannot/am not able to read to her.’  
(Tomić, 2006: 464 (97))

Werkmann (2007) states clearly that, for both Bulgarian and Macedonian, when the subject bears any $\phi$-features other than $3SG$, an agreeing form of the possibility modal verb is used in root contexts, while in epistemic contexts the modal bears $3SG.PRS$ morphology regardless of the subject’s $\phi$-features.

This is consistent with the data provided by Margarita Dimitrova, (p.c.) who used only agreeing forms in deontic contexts, while using $3SG.PRS$ forms in epistemic contexts, regardless of the subjects’ $\phi$-features.

### 3.1.3 Analysis

In terms of deriving root interpretations in Macedonian and Bulgarian, I propose the same analysis I proposed for BCS in the previous chapter, a monoclausal analysis in which the modal is merged as the head of ModP, taking as its complement a MoodP headed by DA (see Tomić (2006) and references therein for a discussion of DA in Macedonian). In examples such as (127) below, where subject agreement morphology is seen on both the
modal and the embedded verb, the subject is undergoing cyclic A-movement and the Agreement Principle (112) holds.

\[\text{(127)} \quad \text{Deca-ta mora-at da } \text{čita-at.} \]
\[
\text{children-DEF must-3PL DA read-3PL}
\]
\`
The children must read.'
\`

To reiterate, I will not consider 3SG subjects here, as 3SG agreement morphology is syncretic with the default and can obscure agreement patterns. For subjects bearing other \phi\text{-features}, the embedded verb shows agreement morphology as the subject cyclically A-moved through Spec, AspP (see Carstens & Kinyalolo (1989)). The modal agrees with the subject as the subject cyclically A-moved through Spec, ModP. I do not posit that Mod moves to T due to the fact that in compound tenses such as in (128), where the modal bears participial morphology, tense is marked on the auxiliary form. However, I leave open the possibility that Mod moves to T when auxiliaries are absent.

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Nie sme mora-le da nauči-me kako da sorabotuva-me.
we be.1PL.PRS must-L-PPT.1PL DA learn-1PL.PRS how DA cooperate-1PL.PRS
‘We had to learn how to cooperate.’ (Macedonian, root)³

The subject having cyclically A-moved through the specifier positions of both Asp and Mod suggests that ModP is part of the same TP as the embedded verb. Assuming that the subject stops cyclically A-moving once it reaches Spec, TP, any agreeing modal is part of the same TP as the embedded verb. Since the modal is the highest verbal element in a TP, we expect to see tense morphology on the modal verb (or auxiliary accompanying it, in compound tenses) any time the modal verb bears agreement morphology.

In these contexts, we expect to only see tense morphology on the modal, with the embedded verb bearing subjunctive, PRS.PFV morphology licensed by DA. If the embedded verb bears any other tense morphology, we expect root interpretations to be ruled out. This prediction can be tested, and is borne out: the Macedonian sentence in (129) can only have epistemic interpretations.

(129) Deca-ta mora da [pristigna-l-e vo petok].
children.DEF must CON come.PFV-L-PART.PL on Friday
‘The children must have arrived on/by Friday.’ (Wiemer, 2014: 131 (6a))

An alternative way to express root meanings, available in Macedonian but not any standard dialect of BCS, is shown in (130). I remain agnostic as to whether the subject undergoes cyclic A-movement in these structures as well – further research could resolve the matter – but regardless of the answer to that question, the modal verb is grammaticalized and bears no φ-feature morphology. On the surface, it appears to bear 3SG morphology, but this is a frozen form.

³From https://off.net.mk, accessed on 6/20/18
In this sense, the Macedonian modal verbs are like the invariant future particle, also referred to as a modal clitic. Tomić (2002: 268) writes: “At an earlier stage, the Balkan Slavic modal clitics were tensed modal auxiliaries, subcategorizing for subjunctive complements introduced by the subjunctive marker da.” The same process is under way for modal verbs može ‘can/may’ and mora ‘must’, and the grammaticalized form merged in the same most local TP as the embedded verb gets interpreted as root.

Epistemic readings are, to repeat, derived only from sentences containing impersonal forms of the modal verbs (leaving aside the issues of ‘potential’). Werkmann (2007) argues that the structure of sentences with epistemic impersonal modal verbs involves CP-embedding. Crucially, unlike what I have discussed for BCS, she does not argue that DA is a complementizer in Macedonian. Instead, Werkmann has the CP embedded under the epistemic modal verb headed by a null complementizer.

---

(130) Deca-ta mora da čita-at.
children-DEF must-3SG DA read-3PL
‘The children must read.’

(Macedonian, root)⁴


⁵Macedonian DA used to be an indicative complementizer as recently as the 18th century, but is currently not used as anything other than subjunctive Mood head (Tomić, 2006).
Thus it is possible to argue that the analysis I proposed for BCS in Chapter 2, analogous to Werkmann’s (2007), applies to Macedonian epistemic modal verb constructions. Werkmann analyzes what she reports is an epistemic-only sentence such as (131) as shown below (diagram simplified here, for details I refer the reader to Werkmann).

(131) Mora deca-ta da čita-at.
     must-3SG children-DEF DA read-3PL
     ‘The children must be reading.’ (epistemic)

The absence of overt complementizers may be considered a problem for such an analysis,\(^6\) although it is possible that the Mood head is linked to C, as argued by Giannakidou (2009) with respect to the Greek Mood head \(na\) which licences PRS.PFV forms in

\(^6\)An overt indicative complementizer can indeed follow epistemic readings of Macedonian modal verb \(može\) ‘can/may’, but is actually interpreted as ‘because’. Let us examine some naturally occurring examples.

(i) A: zs(zošto) ne davash chat so iva bre?
    why NEG give.2SG chat with Iva EXCL
    ‘Why aren’t you putting up chat with Iva?’
ways parallel to what we have seen for *da* here. Alternatively, we could argue that the modal verb embeds a TP rather than a CP.7

Furthermore, let us examine an alternative word order in sentences interpreted as epistemic in Macedonian. This is identical in linear order to the sentence interpreted as root and shown in (130). Werkmann (2007) argued this is derived through raising the subject out of the embedded CP through topicalization, as in (132) below (again, simplified).

---

B: pa neznam brat [moze deka razgovarame za PRIVATNI RABOTI I
dead NEG.know.1SG brother can.3SG C converse.1PL.REPET about private matters and
nesakam da gi stavam tie RABOTI na RAZGLAS].
NEG.want.1SG DA them put.1SG that business on loudspeaker
‘Well I don’t know bro, could be that we’re talking private matters and I don’t want to show
them publicly.’

(ii) Moze deka me vide cela pretresena pa mi zboruvase poveke otkolku sto
can.3SG C me.ACC see.3SG all shaken and me.DAT told.3SG more than what
ocekuvav.
effect.1SG
‘It could be that (the doctor) saw how distressed I was and so told me more than I expected’

Sentences in which CP embedding under a modal verb yields epistemic interpretations exist in English as they do in Macedonian. The reading in (ii), however, isn’t ‘*He may have seen that I was distressed*’ but rather ‘*He may have told me more than I expected BECAUSE he saw my distress*.’ The speaker knows that the doctor saw her distress. The epistemic possibility pertains to the causal relationship between that and the doctor’s giving her more information than he usually did.

Similarly, in (iii) the speaker isn’t stating that they may have lived with Bulgarians, or that they may have had a fun time in London. What is epistemically possible is that London isn’t fun (as argued by others on this forum) but that living with Bulgarians enabled her to have fun.

(iii) Ja moze deka ziveev so Bugarki mene ne mi bese loso vo London, zabavno
I can.3SG C live.1SG with Bulgarians me.DAT NEG me.DAT.CL was bad in London, fun
bese.
was
‘It could be because I lived with Bulgarians (but) I didn’t have a bad time in London, it was fun.’
(https://archives.vmacedonia.com/11367.html, date: 4/26/18)

Such an analysis is closer to those proposed by Cinque (1999) and Hacquard (2006, 2010, 2013), and would still be well aligned with Werkmann (2007), as long as we assumed that Macedonian modal verbs embed finite TPs, from which the subject can topicalize into superordinate TPs. Given that evidence for CP-embedding in BCS comes from a range of diagnostics, and that various languages employ complementizers following epistemic uses of modal verbs, I will assume CP-embedding with a null C head here.
(132) Deca-ta mora da čita-at.
children-DEF must-3SG DA read-3PL
'The children must read.' (epistemic)

The arguments for positing two distinct TPs come from the fact that evidence of two tenses can be seen. I have shown evidence of two distinct tenses marked on the modal and the embedded verb when the modal or the embedded verb bears present tense morphology (see (125a) and (125b)), or when the modal bears conditional morphology (121), repeated below as (133a), (133b) and (134).

(133) a. Ne moževme da go vidime.
NEG can/be-able.1PL.IPF.PST DA 3SG.M/N.ACC see.1PL.PFV.PRS
'We couldn’t/were not able to see him/it.' (Tomić, 2006: 427 (21))
b. Može da dojdat/dojdete.
   can/may.IMPERS DA come.3/2PL.PFV.PRS
   1. ‘They/you can/may come.’
   2. ‘It is possible for them/you to come.’ (Tomić, 2006: 426 (20))

(134) Bi mora-la da živeše na ovaa ulica.
   SBJV must-L-PART.F.SG DA liveIPF.IMPF.3SG on this.F.SG street.F.SG
   ‘She probably lived in this street.’ (Wiemer, 2014: 147 (35))

As stated above, the embedded verb bearing anything other than the subjunctive PRS.PFV morphology is interpreted as epistemic only. This is because root modal verbs are part of the same TP as the embedded verb – only one T head is present. The modal verb being the higher element, it bears tense morphology, and the embedded verb bears subjunctive morphology licensed by DA.

Assuming a biclausal structure in which the subject cyclically A-moves within the embedded CP/TP, we should not see agreement morphology on the modal verbs interpreted as epistemic. This, combined with non-subjunctive morphology on the embedded verb being excluded in root environments, correctly predicts that (135) is ungrammatical in all contexts.

(135) *Deca-ta mora-at da [pristigna-l-e vo petok].
   children.DEF must.PRS.3PL CON come:PFV:L-PERF.PL on Friday
   → no interpretation possible (Wiemer, 2014: 132 (7a))

When the modal is merged below T, with unvalued φ-features, the subject moves through its specifier position to Spec, TP, agreeing with both the modal and the embedded verb, and yielding sentences such as shown in the tree in (127). When the modal is grammaticalized and bears no φ-features, but is merged below TP, the subject agrees with the embedded verb and moves to Spec, TP (see (130)).
When the modal verb doesn’t bear φ-features, epistemic interpretations do not necessarily rely on CP embedding. When the modal verb bears φ-features and multiple agreement is allowed, CP-embedding is required for epistemic interpretations, as the subject needs to be blocked from cyclically A-moving to the specifier position of the modal verb. This is true in BCS, Bulgarian and Macedonian. The following section explores the typology of modal verbs in Slavic, relying heavily on Besters-Dilger et al. (2009), and shows that the use of CP-embedding biclausal structures in epistemic contexts correlates with modal complement finiteness.

3.2 Typology of modality in Slavic

In this section, I present the typological work from Besters-Dilger et al. (2009) and discuss patterns of expressing root and epistemic modality in Slavic languages, including but not limited to those I have presented in this dissertation. I show that the languages that allow for (or require) agreement on both the modal verb and the embedded verb in root interpretations also require a CP barrier between the modal verb and the embedded verb for epistemic interpretations. In languages where subject agreement is restricted to only the modal (due to infinitival complementation), or only the embedded verb (due to modal grammaticalization), a CP-embedding, biclausal structure is a sufficient, but not a necessary condition to eliminate root interpretations.

Besters-Dilger et al. (2009) discuss modal elements that express multiple modal flavors, including but not limited to modal verbs. As I am only discussing modal verbs in this dissertation, I present a subset of types of modals they discuss, namely the types that include verbs. This excludes modals such as Russian adjectival dolžen ‘(to be) obliged’ (type (1b) in Besters-Dilger et al. (2009)), although I will briefly touch on this particular adjective. I also leave aside Type 3, Type 4 and Type 5 modals that co-occur with subject-
like non-nominatives, examining only the modal verbs that can be interpreted as either root or epistemic.

To briefly note, Type 3 constructions involve functional modal verbs (including *trebati* in BCS) in constructions with Dative subjects, embedding infinitives and bearing default 3SG morphology. Cross-linguistically such constructions are only ever interpreted as root, so I will not discuss them here. As for Type 4, Besters-Dilger et al. (2009) report that it only exists in Serbian and Bulgarian, and exemplify it by (136).

(136) Ako nam treba da zamenimo jedan znak u izrazu koristimo symbol tačke.
If we.DAT need.3SG.PRS DA replace.1PL.PRS one sign in expression-LOC.SG use.1PL.PRS symbol full.stop-GEN.SG
‘If we need to replace an element of the expression, we use a full stop.’
Besters-Dilger et al. (2009: 176 (22))

I see no reason for sentences such as this one, in BCS at least, to be treated as separate from the lexical verb *trebati* ‘need’. In its lexical uses, *trebati* takes dative experiencer subjects, and nominal or clausal complements. I have shown this use in Chapter 2, §2.2.1, and I will not discuss these uses further here.

Type 5 is diachronically derived from Type 3 and 4 constructions. In Type 5 constructions, the modal bears default 3SG.N morphology, or is adverbial like the Polish *trzeba* ‘must’. The embedded verb is infinitival, as in Types 3 and 4. Polish has a range of modals that appear in such constructions (*można* ‘can’, *należy* ‘must’ and *trzeba* ‘must’), but they occur in Czech, Slovak, Ukrainian and Belarusian as well. An example is in (137). Crucially, Type 5 is also never used in epistemic contexts.

(137) Należało pracować.
must-PPT.3SG.N work-INF
‘One had to work.’
Polish, (Besters-Dilger et al., 2009: 176 (23))

---

8But see Veselinović (2011) for a discussion of the syntax of Type 3 in BCS and Russian.
In Table 3.2, I show the types of modal verb constructions identified by Besters-Dilger et al. (2009), and list the languages that use each of the construction types. The types relevant to the current discussion are marked by asterisks. I added Macedonian, which was not included by Besters-Dilger et al., based on the data I presented in this chapter. I will maintain the type numbers from Besters-Dilger et al. (2009), but the reader should keep in mind that types 3, 4 and 5 will not be mentioned past this point.

<table>
<thead>
<tr>
<th>Construction</th>
<th>Agreement patterns</th>
<th>Languages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type 1*</td>
<td>Nominative subject, Modal = +AGR, Verb = -AGR</td>
<td>Old Church Slavonic, Polish, Czech, Slovak, Upper Sorbian, Lower Sorbian, Russian, Ukrainian, Belarussian, Slovenian, BCS</td>
</tr>
<tr>
<td>Type 2*</td>
<td>Nominative subject, Modal = +AGR, Verb = +AGR</td>
<td>BCS, Bulgarian, Macedonian</td>
</tr>
<tr>
<td>Type 3</td>
<td>Dative subject, Modal = -AGR, Verb = -AGR</td>
<td>Polish, Slovak, Russian, Ukrainian, Belorussian, Slovenian, BCS</td>
</tr>
<tr>
<td>Type 4</td>
<td>Dative subject, Modal = -AGR, Verb = +AGR</td>
<td>BCS</td>
</tr>
<tr>
<td>Type 5</td>
<td>No subject, Modal = -AGR, Verb = -AGR</td>
<td>Polish, Czech</td>
</tr>
<tr>
<td>Type 6*</td>
<td>Nominative subject, Modal = -AGR, Verb = +AGR</td>
<td>BCS, Slovenian, Bulgarian, Macedonian</td>
</tr>
</tbody>
</table>

Table 3.2 – Types of modal constructions in Slavonic languages; Besters-Dilger et al. (2009)

Here I follow what is by now a standard assumption (Wurmbrand, 2001: i.a.) that modal verbs do not take external arguments, but rather only a single internal one (vP, MoodP, TP or CP).

Type 1, with the modal verb embedding an infinitival complement, is represented in Western dialects of BCS, mainly in Croatia but also in Bosnia and less commonly in
Serbia. This type is prescribed by the Croatian standard. I have not discussed this type when discussing BCS, as (to the best of my knowledge) it is not ambiguous between root and epistemic interpretations – the embedded infinitive is a counterpart of the embedded subjunctive MoodP, and is only interpreted as root. Across the Slavic languages, Type 1 is the most common, as shown by Table 3.2. Examples of this construction type from East, West and South Slavic languages are shown in (138a–d) below.

(138) a. My možem rabotat’.
    we.NOM can.1PL.PRS work-INF
    ‘We can work.’ Russian, (Besters-Dilger et al., 2009: 171 (6))

b. Niewysuszony korzeńnom może pleśnieć w akwarium.
    not.dried.NOM.SG root.NOM.SG can.PRS.3SG mold.INF in fish.tank
    ‘The moist root can mold in the aquarium.’ Polish, (Hansen, 2014: 100 (14))

c. Ne-môžem to vydržat’.
    NEG-can.1SG.PRS that stand.INF
    ‘I can’t stand that any longer.’ Slovak, (Besters-Dilger et al., 2009: 169 (1))

d. Ivan mora raditi.
    Ivvan.NOM can.3SG.PRS work-INF
    ‘Ivan can work.’ BCS, (Besters-Dilger et al., 2009: 172 (12))

In Russian, Type 1 sentences can be used in root and epistemic contexts, with the modal verb showing subject agreement morphology. For example, the data in (139a–c) all show Type 1 sentences elicited through using deontic, circumstantial and epistemic contexts (contexts modified from Vander Klok (2014)).

(139) a. Vy vse možete vojtì.
    you.2PL.NOM all.NOM can.2PL.PRS enter.PFV.INF
    ‘You can all enter.’ (deontic, Mariia Esipova, p.c.)

b. Derek možet xodit’.
    Derek.NOM can.3SG.PRS walk.IPF.INF
    ‘Derek can walk.’ (circumstantial, Mariia Esipova, p.c.)
c. Oni mogut byť v Avstrii.
   they.NOM can.3PL.PRS be.INF in Austria
   ‘They could be in Austria.’ (epistemic, Mariia Esipova, p.c.)

Upper and Lower Sorbian only have Type 1 constructions with modal verbs, as did Old Church Slavonic. Czech only has Type 1 modal verbs (it does also have adverbial třeba), and East Slavic languages, as well as Slovak, only have Type 1 modals or Type 3 modals, in which the subject bears dative case and no verbal elements show subject agreement. Slovenian also has these two types, as well as a non-agreeing adverbial lahko ‘can’. In most of these languages, Type 1 constructions can be used in both epistemic and root environments.

Type 2, on the other hand, is the type I discussed the most in this dissertation, as it pertains to all the South Slavic languages I discussed here (BCS, Macedonian, Bulgarian). This type of modal verb construction shows subject agreement morphology on both the modal verb and the embedded verb. In BCS, Macedonian, and Bulgarian this construction is interpreted as root only. Besters-Dilger et al. (2009) report that this construction only occurs in Serbian and Bulgarian (they don’t report on Macedonian), and state that in Serbian this type of construction can be interpreted as epistemic. However, their evidence for epistemic uses seems to rely on conditional uses such as (140) below, where the conditional morphology is likely contributing to the epistemic interpretation.

(140) Ivan bi morao da radi.
      Ivan be.3SG.AOR must-PPT.M.SG DA work.3SG.PRS
      ‘Ivan should work.’ (Besters-Dilger et al., 2009: 175 (19))

Type 6, again, only occurs in the South Slavic languages, where the modal verb can bear no agreement morphology, while the embedded verb agrees with the subject. I have shown examples of this type in both this and the previous chapter. Additionally, Besters-
Dilger et al. (2009) include here the Slovenian adverbial lahko ‘can’. As I investigate modal verbs in this dissertation, I leave that aside. The languages that do have Type 6 constructions with modal verbs also include Macedonian (as shown in this chapter).

Besters-Dilger et al. (2009) state that, within possibility modal verbs, only Bulgarian has a Type 6 construction, and only in epistemic contexts, and that Serbian and Bulgarian both have Type 6 construction with necessity modal verbs, in both root and epistemic contexts. The Serbian claim is supported by data that again involve conditional morphology, here on the modal treba ‘need’. However, Type 6 constructions in necessity contexts are exemplified by data such as (141a–c) below. In BCS, Type 6 constructions only have epistemic readings. In Bulgarian and Macedonian, they can have either root or epistemic readings.

must-3SG.PRS DA Ana study-3SG.PRS  
‘Ana must be studying’ (BCS, □ epistemic, #deontic)  

b. Petja trjabva da e v xol-a.  
Petja must DA be.3SG.PRS in living room-DEF.M  
‘Petya must be in the living room.’ (Bulgarian, □ epistemic, deontic)  

c. Deca-ta mora da čita-at.  
children-DEF must-3SG DA read-3PL  
‘The children must read.’ (Macedonian, □ epistemic, deontic)  

With possibility modal verbs, Type 6 constructions are ambiguous in Macedonian, and interpreted as epistemic only in Bulgarian. In BCS, an infinitival biti emerges following the modal verb in epistemic contexts, creating a hybrid Type 6/1 construction, while the historically available Type 6 construction with the possibility modal verb lexicalized into the epistemic possibility modal adverb možda ‘maybe’ (see Chapter 2).

What we see is that Type 6 and Type 2 are non-agreeing and agreeing forms of modal verbs that embed subjunctive complements, respectively. Leaving the issues of
conditional/potential morphology aside, Type 2 covers root meanings, while the grammaticalized, non-agreeing modal verbs in Type 6 either cover epistemic readings (BCS, possibility modal in Bulgarian) or can be used in either root or epistemic contexts (Macedonian, necessity modal in Bulgarian).

The Slavic language family thus neatly divides into languages that utilize infinitival complements of modal verbs, and those that utilize subjunctives. The modal verbs that embed subjunctive complements use agreeing morphology on the modal verb in root contexts only, while epistemic contexts tend to rely on grammaticalized, non-agreeing forms of modal verbs. The modal verbs with infinitival complements have such complements in both root and epistemic contexts, although some exceptions exist.

Grammaticalized, non-agreeing forms of the Russian modal adjective dolžen ‘must’ are also possible in epistemic contexts. While root contexts require an agreeing form of this adjective (142a), epistemic contexts vary in whether they permit an agreeing form (142b) or require a N.SG default (compare (142c) to (142d), and (142e) to (142f)). The Russian data below are all from Mariia Esipova (p.c.), elicited using a modified version of Vander Klok’s (2014) questionnaire.

(142) a. Oni dolžny byt’ ostorožny.
   they.NOM must.ADJ.PL be.INF careful.PL
   ‘They must be careful.’ (while driving, according to the law)

b. Bob i Řemili dolžny byt’ v “Sove”.
   Bob.NOM and Emily.NOM must.ADJ.PL be.INF in Sova.ACC
   ‘Bob and Emily must be at ‘Sova’.’ (because they usually are)

c. Dolžno byt’, vse golovnye boli ot stressa.
   must.ADJ.SG.N be.INF all.PL.NOM head pains from stress
   ‘All the headaches must be from stress.’ (we eliminated alternatives)
d. ?#Vse golovnye boli dolžny byť’ ot stressa.
   all.PL.NOM head pains must.ADJ.PL be.INF from stress
   ‘All the headaches must be from stress.’ (we eliminated alternatives)

e. Dolžno byť’, Džon s synom čixajut.
   must.ADJ.SG.N be.INF John.NOM with son.INS sneeze.3PL.PRS
   ‘John and his son must be sneezing.’ (they’re in a dusty place, and suffer
   from allergies)

f. *Džon s synom dolžny čixat’.
   John.NOM with son.INS must.ADJ.SG.N be.INF sneeze.INF
   ‘John and his son must be sneezing.’ (they’re in a dusty place, and suffer
   from allergies)

The construction in (142c) and (142e) is reminiscent of constructions containing
BCS modal verbs used in epistemic contexts (143). The Russian modal forms a prosodic
unit with the infinitival ‘be’, shows default neuter singular agreement and occurs at the
beginning of the utterance.

(143) Mora-∅ bi-ti da Džon i njegov sin kiš-u.
     must-3SG.PRS be-INF DA John and his son sneeze.IPF-3PL.PRS
     ‘John and his son must be sneezing.’ 
     (BCS)

These adjectives, like BCS, Bulgarian, and Macedonian modal verbs, show agreement
morphology in root contexts, but not always in epistemic contexts (142b), (142c) and (142e).
As this dissertation only attempts to discuss modal verbs, I leave these adjectives aside,
noting that they exhibit similar syntactic behavior when it comes to the epistemic/root
split, both in terms of subject φ-feature agreement and in terms of the emergence of in-
finitival byt’ ‘be’ following epistemic uses.

The key takeaway from this section is that within the Slavic language family, those
languages that allow for agreement on both the modal verb and the verb embedded in the
modal complement, also require that the modal not agree in order to be used in epistemic
contexts. Modal verb grammaticalizing allows for non-agreeing forms to be used in root contexts as well, but agreeing forms (outside of ‘potential’ forms typically used in conditional environments) cannot be used in epistemic contexts. A pattern that is not observed is for agreeing forms to be used in epistemic contexts, while non-agreeing forms are used in root contexts.

This, I argue, stems from the fact that the Specifier of modal verbs which have unvalued φ-features and embed subjunctive MoodP is an available position for a subject en route to Spec, TP. In languages that allow for multiple subject agreement (i.e., successive cyclic A-movement), the subject will go through Spec, ModP, which yields a subject-oriented (non-epistemic, see Brennan (1993); Bybee et al. (1994), i.a.) interpretation of the modal verb. To get an epistemic interpretation, the modal verb must be merged high enough to not get associated with the subject – this means above TP. In some (BCS) or possibly all South Slavic languages with this type of modal verb, this also means above CP. In BCS, this CP is indicative, while in Bulgarian and Macedonian it may be subjunctive. The subject then moves to Spec, TP, agreeing with Asp on the way, but does not interact with the modal verb, having had its Case feature checked in Spec, TP. The modal verb, being in a separate TP/CP, and having unvalued and unchecked φ-features, takes on default 3SG morphology.

In languages where only the modal verb agrees (due to infinitival modal complementation), agreement is observed in both root and epistemic contexts. I propose that, cross-linguistically, CP-embedding under otherwise ambiguous modal verbs eliminates their root interpretation.

The two types of modal verbs are then as in Table 3.3. Type A modal verbs are BCS modal verbs discussed in Chapter 2, as well as Macedonian and Bulgarian modal verbs discussed in this chapter. These modal verbs require a CP barrier to separate them from the embedded verb in order for epistemic interpretations to obtain. Type B modal
verbs are the West and East Slavic modal verbs discussed by Besters-Dilger et al. (2009). For such modal verbs, a CP barrier will yield an epistemic interpretation, although it is not a requirement, as non-finite TP complements can also yield epistemic readings in constructions that are surface-identical to the root ones.\(^9\)

The next section provides some evidence for that claim, exploring the data from some languages in which multiple agreement, i.e., on both the modal verb and the verb embedded under it, is available. I hypothesize that, in such languages, epistemic interpretations are only available to biclausal constructions.

### 3.3 Beyond Slavic

In this section, I discuss possible extensions of the generalizations I offered beyond the Slavic language family. I show that a CP barrier between the modal and the embedded verb is a sufficient condition for eliminating root interpretations of otherwise ambiguous modal verbal elements, using data from Romanian, Spanish, French, Greek, Maltese, Moroccan Arabic, Modern Standard Arabic and Hebrew. Additionally I show that within the Romance language family, there is a parallelism in structural differences between epistemic and root modalities to what I have shown for Slavic. Namely, the language that permits subject agreement with both the modal and the embedded verb (Romanian,

\(^9\)A non-finite CP could also be posited there, but without an overt complementizer or further syntactic diagnostics to support that argument, I will assume a TP-embedding structure for epistemic readings of Type B modal verbs.

<table>
<thead>
<tr>
<th>Type</th>
<th>Interpreted as root</th>
<th>Interpreted as epistemic</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Modal = +AGR, Verb = +AGR, +FIN</td>
<td>CP embedding (obligatory)</td>
</tr>
<tr>
<td>B</td>
<td>Modal = +AGR, Verb = -FIN</td>
<td>CP embedding (optional)</td>
</tr>
</tbody>
</table>

**Table 3.3** – Types of modal verbs in Slavic languages.
§3.3.1.1) also uses biclausal, CP-embedding structures to express epistemic meanings, as was independently argued by Soare (2009).

I show that the generalization I made for BCS, Macedonian and Bulgarian holds in languages that allow simultaneous agreement on the modal verb and the embedded verb. In particular, I show that the Greek boro ‘can’, Maltese seta ‘can’, Moroccan Arabic qdr ‘can, may’, and Hebrew yaxol ‘can’ all bear subject’s φ-features when used in root-compatible contexts, but not when used as epistemic. Beyond that, I show varying amounts of evidence that these modal verbs all utilize biclausal, CP-embedding constructions to express epistemic meanings.

I conclude this section by discussing the possible range of languages predicted by my analysis, and those that would, if found, falsify the hypotheses offered here.

3.3.1 Romance

This section explores modal verbs in Romance languages, taking as a starting point the observations made in the cross-Slavic section: in all the Slavic languages which exhibit agreement on both the modal verb and embed agreeing (subjunctive) complements, such constructions always yield root meanings. Modal verbs used in such constructions can only have epistemic interpretations in biclausal (CP-embedding) structures, where the modal verb does not agree. CP-embedding constructions yield epistemic interpretations of modal verbs even in languages in which they typically embed non-finite, non-agreeing complements. However, if modals embed non-finite complements, CP embedding is not a prerequisite for epistemic interpretations.

I will first focus on Romanian, the Romance language that shares robust use of subjunctive and other features of Balkan Sprachbund with the Slavic languages that exhibit CP-embedding under modal verbs. I will show evidence that epistemic modality
in Romanian is often expressed through biclausal, CP-embedding structures, which was observed by Soare (2009). Then I will go on to show that languages which rely on infinitival modal complements do so in both root- and epistemic-compatible contexts and also use impersonal, CP-embedding constructions which have unambiguously epistemic readings (Spanish, French). In this way, I show that the generalization derived from the Slavic languages also applies to the Romance family – Romanian modal verbs are Type A (although they are grammaticalizing), whereas Spanish and French are Type B.

3.3.1.1 Romanian

Romanian uses a modal verb *a putea* ‘can/may’ to express possibility. This modal verb agrees with the subject and can embed subjunctive complements introduced by the subjunctive Mood marker *să*. This is parallel to *da* in Macedonian and *da₂* in BCS. In such constructions, shown in (144), both the modal and the embedded verb show agreement with the subject.

(144) a. Copiii pot să plece.
   boys.DEF.M.PL can/may.3PL SBJV leave.3PL.PR.SBJV
   ‘The boys can/may leave.’
   (Tomić, 2006: 523 (219))

   b. (Voi) puteți să vă plimbați.
   you.PL can/may.2PL SBJV 2PL.ACC.CL walk.2PL.SBJV.PRS
   ‘You can/may go for a walk.’
   (Tomić, 2006: 523 (219))

Alternatively, *a putea* ‘can/may’ embeds so-called *short*, a-less infinitive complements (145a) (similar to English *to*-less, or German *zu*-less infinitives), despite infinitives otherwise not being used extensively in Romanian beyond literary language (Tomić, 2006).

Infinitival complements of *a putea* ‘can/may’ are in seemingly free variation with subjunctive complements (Soare, 2009; Meisnitzer, 2012), as evidenced by (145a) and (145b), from Motapanyane & Avram (2001) via Meisnitzer (2012).
The minimal structure we need to assume for Romanian modal verbs in infinitive-embedding structures is vP embedding (146). Additionally, I don’t assume anything about the issue of whether the modal verb moves to T, and agrees with the subject in that local configuration (shown in the diagram below) or the modal stays in Mod and gets its φ-features checked in a different way.

As the facts about actuality entailments for Romanian perfective modal verbs in infinitive embedding constructions are parallel to those in French, I am assuming that an analysis along the lines of Hacquard (2006, 2013) can account for such uses of the Romanian a putea ‘can’. Before moving on to subjunctive-embedding uses, let us examine the Romanian necessity modal a trebui, ‘must’. Unlike a putea ‘can’, a trebui cannot embed infinitives (Tomić, 2006; Soare, 2009; Meisnitzer, 2012). Subjunctive complements of the
type shown for *a putea* in (148) are possible, with the caveat that *a trebui* shows no agreement, i.e. it is grammaticalized in the present tense. In syncretic past tenses, it agrees with the subject in number, but not person, maintaining 3rd person features regardless of the φ-features of the subject. Mehnitzer (2012) reports that *a trebui* ‘must’ only has a deontic interpretation, but Tomić (2006) and Soare (2009) both discuss its epistemic uses, and Oana Savescu (p.c.) and Mara Panaitescu, (p.c.) both used *a trebui* ‘must’ in epistemic contexts. A simple use is shown in (147) below.

(147) Trebui să plece.
must/shoud/ought.3SG SBJV leave.3PL.PRS.SBJV
‘They must/should/ought to leave.’

(Tomić, 2006: 522 (217))

In this sense, *a trebui* ‘must’ is similar to the Bulgarian *trjabva* ‘must’, while the subjunctive-embedding uses of *a putea* are similar to the Bulgarian, Macedonian and BCS possibility modal verbs. Assuming the analysis I proposed above, the minimal structure we need to assume for subjunctive-embedding uses of *a putea* is as shown in (148).

(148) Ioana poate să plece.
Ioana can.3SG.PRS SBJV leave.3SG.SBJV
‘Ioana can leave.’

(Soare, 2009: 248 (17a))
Unlike BCS, Romanian has a subjunctive complementizer, *ca*, as opposed to the indicative complementizer *că*, which is parallel to the BCS *da* indicative complementizer. A *trebuie* can take subjunctive or indicative CP complements introduced by *ca* or *că*, respectively. Tomić (2006: 521, fn.212) reports that “While when [a *trebuie*] takes a subjunctive complement the sentence has a deontic reading, when it takes an indicative complement, it has an epistemic reading.” Examples of indicative and subjunctive CP complements of invariable *a trebuie* ‘must’ are in (149). Indicative-embedding sentences such as (149a) are only reported to have epistemic interpretations. Subjunctive-embedding sentences such as (149b), according to Tomić (2006), only have root interpretations.\(^{10}\)

\[(149)\]

a. Trebuie că plecă.
   must/shoud/ought.3SG C leave.3SG.PRS.IND
   ‘(S)he must/should/ought to be leaving.’
   (epistemic, *root)

b. Trebuie ca copiii să plece.
   must/shoud/ought.3SG C.SBJV boys.M.PL.DEF SBJV leave.3PL.PRS.SBJV
   ‘The boys must/should/ought to leave.’
   (*epistemic, root)

An invariable *poate* exists as well. It is identical in form to 3SG.PRS form of *a putea* ‘can/may’, and can scope over the entire clause (150a). Additionally, according to Soare (2009) and Tomić (2006), an invariable form *se poate* ‘SE can.3SG’ also only gets an epistemic interpretation, with pre-modal subjects being interpreted as Topicalized out of the embedded clause (150b). The default word order in this case is as in (150c). It is also possible for the subject to be preceded by the subjunctive complementizer *ca*, as in (150d).

\(^{10}\)Mara Panaitescu (p.c.) also finds (149b) unacceptable in epistemic contexts, but Oana Savescu (p.c.) reports that *a trebuie* ‘must’ obligatorily embeds complements introduced by *ca* in epistemic contexts if the embedded verb is eventive, while *să* can introduce stative complements of epistemic *a trebuie* ‘must’. I will follow Tomić (2006), but future research will hopefully expand our knowledge of variation when it comes to Romanian modal verbs.
(150)  

a. Poate că Petre s-a rătăcit.
   can.3SG.PRS C Petre SE-has lost
   ‘Peter may have got lost.’ (Soare, 2009: 250 (29a), epistemic)

b. (Maria) se poate să fi luat trenul
   Maria SE can.3SG.PRS SBJV have take train.DEF
   ‘Maria may have taken the train.’ (Soare, 2009: 250 (27), epistemic)

c. Se poate să plece copiii.
   SE can.3SG.PRS SBJV leave.3PL boys.M.PL.DEF
   ‘It is possible that the children leave.’ (Tomić, 2006: 523, fn.214, epistemic)

d. Se poate ca copiii să plece.
   SE can.3SG.PRS C.SBJV boys.M.PL.DEF SBJV leave.3PL
   ‘It is possible that the children leave.’ (Tomić, 2006: 523, fn.214, epistemic)

The Romanian indicative CP-embedding epistemic-only sentences, such as (149a) and (150a), fit the analysis of epistemic uses of modal verbs I proposed for BCS, Bulgarian and Macedonian. Furthermore, Soare (2009) argues that even in sentences such as (144b) and (147), where the modal embeds a complement headed by the subjunctive să, the modal complement in epistemic contexts is a CP, whereas it is a vP in root contexts. This, with the difference being that I propose that root modals embed MoodP is exactly parallel to my analysis of BCS. Soare has MoodP above TP, rather than above AspP and below TP. I propose, based on examples such as (149b) and (150d) above, where the subject precedes the Mood marker, that the subjunctive Mood is lower than T in Romanian, as in my analysis of BCS in Chapter 2 and Bulgarian and Macedonian in this chapter.

The argument proposed by Soare (2009) is based on actuality entailments (the un-cancellable implication that past ability was realized when the ability modal is in past perfective). These entailments are present in Romance languages and discussed by Bhatt (1999) and Hacquard (2006), among others. Soare argues that while epistemic interpretations in other Romance languages can be derived when the modal is inserted above T, as proposed by Cinque (1999); Condoravdi (2002); Hacquard (2006), a.o., Romanian epis-
temic modals can embed clausal (CP) complements. The basis for this argument is the fact that Romanian modal verbs behave like other Romance modal verbs, in that they are ambiguous between epistemic and root readings in the present and imperfective. Additionally, perfective morphology (auxiliare *avea* ‘have’ combined with a past participle) on the modal verb *a putea* ‘can’ yields actuality entailments in Romanian, as it does in French. The key difference is that in Romanian it also ONLY yields ability readings, eliminating epistemic interpretations (151).

(151) a. Petre a putut să deschidă / deschide ușa Și
Peter have.3SG can.PPT SBJV open.3SG.PRS.SBJV / open.INF door-DEF and
n-a deschis-o.
did not open it
‘Peter could have opened the door (#and he didn’t).’ Soare (2009: 245 (13a))
(root, *epistemic)

Petre a trebuit să deschidă ușa Și n-a deschis-o.
Peter have.3SG must.PPT SBJV open.3SG.PRS.SBJV door-DEF and did not open it
‘Peter must have opened the door (#and he didn’t).’ Soare (2009: 245 (13a)) (root, *epistemic)

Soare argues that this inability for a perfective-marked modal verb to be interpreted as epistemic in Romanian follows from the structure in (152a) below, which she contrasts to the structure available to French and Spanish, shown in (152b) (simplified).

(152) a. Romanian, biclausal

\[
\begin{array}{c}
\text{MP} \\
\text{TP} \\
\text{AspP} \\
\text{T} \\
\text{Asp} \\
\text{MP} \\
\text{M}_{\text{ROOT}} \\
\text{VP}
\end{array}
\]

b. Romance, monoclausal

\[
\begin{array}{c}
\text{V} \\
\text{CP} \\
\text{putea} \\
\text{C} \\
\text{MoodP} \\
\text{Mood} \\
\text{să} \\
\text{fi plecat}
\end{array}
\]
Thus we see the emergence of the same pattern I discussed above within the Slavic language family: the Type A modal verbs allowing for agreement on both the modal verb and the verb inside its complement also require a biclausal construction for the modal to be interpreted as epistemic. Within Romance, Romanian *a putea* ‘can’ is a Type A modal verb (it is also used as a Type B modal verb) – both the modal verb and the verb it embeds can show agreement. *A trebui* ‘must’ is grammaticalized, like the Bulgarian *trjabva* ‘must’, but requires CP complements in epistemic contexts. The structure of epistemic-only sentences with perfective morphology on the embedded verb is shown in (153).

(153) Maria trebuie că a luat trenul.
María must.3SG.PRS C has taken train.DEF
‘Mary must have taken the train.’

Soare (2009: 250 (28c))
Without topicalizing, the structure of epistemic (150a) is in (154) below. For root uses, the structure would be as in (155) below – this is, in terms of structure, the same as (148), repeated here as a better parallel to epistemic (153) and (154).

(154) Poate că Petre s-a rătăcit.  
     can.3SG.PRS C Petre SE-have.3SG lost  
     ‘Peter may have got lost.’  
     (Soare, 2009: 250 (29))

(155) Copiii pot să plece.  
     boys.M.SG.DEF can.3PL SBJV leave.3PL  
     ‘The boys can/may leave.’  
     (Tomić, 2006: 523 (219))
Soare (2009) shows that Romanian constructions with bare infinitive modal complements allow epistemic readings with perfective modals, provided that the embedded predicate is stativized with a covert BE. She proposes that, in monoclausal constructions, epistemic operators select BE + propositional context. I propose that the same is true in at least some biclausal constructions. We have seen the presence of *biti* ‘be.INF’ following epistemic uses of modals in BCS biclausal constructions, as well as *byt’ ‘be.INF’ in Russian examples such as (142c) and (142e).\(^{11}\) I will show, throughout this chapter, that the stativizing BE appears following the modal verb in epistemic contexts in Spanish §3.3.1.2, Maltese, Moroccan Arabic and Hebrew §3.3.3.

In the next sections I will show that, just as in Slavic, biclausal structures yield epistemic readings of the modal even in the languages in which they are not a prerequisite for such readings. For Romance languages, I will use Spanish and French as examples to show that structures of the type shown in (149a) yield epistemic interpretations in languages in which modal verbs never obligatorily embed CPs.

### 3.3.1.2 Spanish

As stated in Chapter 1, Marrano (1998) argued that, for Spanish modal verbs *poder* ‘can’ and *deber* ‘must’, the epistemic and root interpretations are merged at distinct positions in the clause, in the style of Cinque (1999). Epistemic interpretation, she argues, obtains when the ModP is “structurally close to CP”, while root interpretations are “associated with a ModP that is situated nearer to the VP” (Marrano, 1998: 106). She proposes two distinct TPs, a higher, finite one, and a lower one where nonfinite T is checked. In presenting her analysis, I will follow an alternative she proposes: “Alternatively, the infinitive in Spanish might also be viewed as a type of mood such that TP2 would correspond more

\(^{11}\)This same BE is likely lexicalized along with the modal verb in epistemic modal adverbs such as the French *peut-être* ‘maybe’, in which *être* ‘be.INF’ follows the 3SG.PRS form of the modal verb. Another example is the *be* in *maybe.*
closely to a Mood Phrase than to a nonfinite Tense Phrase.” (Marrano, 1998: 112 (fn.7)).

The structure for a sentence such as (156), in which the epistemic *deber* ‘must’ scopes over the deontic *poder* ‘can’, adapted to a contemporary Minimalist framework, is below:

(156) Los chicos deben poder hacer-lo (o no lo harian).
     The boys must.3PL can.INF do.INF-it or NEG it do.COND.3PL
     ‘The boys must be able to do it (or they wouldn’t).’ (Marrano, 1998: 127 (24a))

The MoodP, or lower of the two TPs in Marrano’s (1998) analysis, is non-finite and hosts root modals when epistemic modals also exist in the structure. Alternatively, when the sentence contains only root modals, the modal moves to the higher T and the verb embedded under it moves to the lower, non-finite T to check its non-finite features. When both modals are present, the embedded lexical verb stays in situ, not needing its own non-finite features checked. Embedding non-agreeing, infinitival modal complements, these are Type B modal verbs, like those seen in East and West Slavic languages.

To test the hypothesis that CP-embedding is a sufficient condition for eliminating root interpretations of Type B modal verbs, let us look at an epistemic modal construction which Marrano (1998) reports is peculiar to *poder*, namely ‘*puede que* + CP’. She reports
that the sentences in (157) below are equivalent in epistemic contexts (Marrano, 1998: 214 (37a-c)).

(157) a. Jose ha podido ir al cine con Lola.
    Jose have.3SG.PRS can.PPT go.INF to cinema with Lola
    ‘Jose might have gone to the movies with Lola.’ (epistemic, root)

b. Jose puede haber ido al cine con Lola.
    Jose can.3SG.PRS have.INF go.PPT to cinema with Lola
    ‘Jose might have gone to the movies with Lola.’ (epistemic, root)

c. Jose puede que haya ido al cine con Lola.
    Jose can.3SG.PRS SBJV have.3SG.PRS.SBJV go.PPT to cinema with Lola
    ‘Jose might have gone to the movies with Lola.’ (epistemic, *root)

We see that, as expected from Type B modal verbs, Spanish modal verbs embed infinitival complements in (157a) and (157b) and get epistemic interpretations, as well as root interpretations. What is interesting here is (157c), where the modal embeds a subjunctive complement introduced by que. In this structure type, the subject can either precede (157c) or follow the modal verb (158). This is also the most acceptable way for epistemic possibility modals to embed deontic necessity modals (Marrano, 1998).

(158) Puede que Juan tenga-que entregar-lo mañana.
    can.3SG sbjv Juan have.3SG.PRS.SBJV-to turn.in-it tomorrow
    ‘Juan could have to turn it in tomorrow.’ (Marrano, 1998: 5, fn.1)

Here the epistemic modal embeds a subjunctive CP. This is different from the BCS (Chapter 2), where epistemic verbs embed indicative CPs, but the Spanish constructions are biclausal nonetheless. The epistemic modal precedes the subject and shows 3SG indicative morphology regardless of the subject’s φ-features, while the embedded verb agrees with the subject in full and bears subjunctive morphology licensed by que (159). Further-
more, the subject can precede the modal if Topicalized, along the lines of what I have shown for BCS, Macedonian and Romanian – compare (159c) and (159d).

(159)
a. Puede que ellos no supieran al uno del otro.
can.3sg.prs c.sbjv they neg.3pl.imp.sbjv to one of other
‘They may not have known of each other.’
(from abretelibro.com, accessed on 6/20/18)

b. Puede que tu tuvieras mala suerte.
can.3sg.prs c.sbjv you.2sg have.2sg.imp.sbjv bad luck
‘You may have been unlucky.’
(from eurogamer.es, accessed on 6/20/18)

c. Algunos de vosotros puede que no sepáis...
some.m.pl of you.2pl can.3sg.prs c.sbjv neg.2pl.imp.sbjv
‘Some of you may not know...’
(from bilingualreaders.es, accessed on 6/20/18)

d. Puede que vosotros no lo sepáis, pero evidentemente
un platano puede vencer a una momia.
can.3sg.prs c.sbjv you.2pl neg it know.2pl.imp.sbjv, but evidently
a banana can defeat a mummy
‘You may not have know it, but evidently a banana can defeat a mummy.’
(from colegiosfram.org, accessed on 6/20/18)

I leave for future research the questions of distribution of indicative vs. subjunctive CP complements of epistemic modals, and their correlation with root modals embedding subjunctive vs. infinitival complements. The generalization from Slavic appears to hold in Romance as well: Type A modal verbs do not have CP embedding as a necessary condition for epistemic interpretations, but they treat it as a sufficient one. This is true of the Spanish poder ‘can’. Deber ‘must’ is not used in the same way, but it is used epistemically in biclausal constructions followed by ser ‘be.inf’, exemplified in (160), as a parallel to what is attested in BCS with može biti ‘can be’ in epistemic contexts. The emergence of overt BE following the modal verb in epistemic contexts further strengthens the argument in favor of a stativizing BE following epistemic uses of modal verbs.
This section has shown that CP-embedding under Spanish Type B modal verbs is possible and yields epistemic interpretations only, as predicted. The next section shows that French, like Spanish, can use biclausal constructions in which impersonal 3SG modal verbs embed CP complements to express epistemic modality.

3.3.1.3 French

This section shows impersonal uses of modal verbs embedding CP complements in French which, according to Palmer (1986) are interpreted as epistemic. Unlike Spanish, French is not a pro-drop language, meaning it requires an overt expletive subject in impersonal sentences. In French, as is well known from the rich literature Bhatt (1999); Hacquard (2006); Borgonovo & Cummins (2007) modal verbs pouvoir ‘can’ and devoir ‘must’ embed infinitival complements, bear tense (T) and aspectual (Asp) morphology, and depending on a range of factors, including tense and aspect, can get root or epistemic interpretations. This makes them Type B modal verbs. However, along with ambiguous sentences such as (161a), pouvoir ‘can’ can be used in unambiguous biclausal impersonal epistemic constructions (161b) and (161c). These constructions are biclausal, with a CP introduced by que, and as predicted, cannot be interpreted as root. Prescriptively, the embedded CP is subjunctive, and (161c) is not grammatical. However, colloquially subjunctive is rarely used in these constructions, and more likely to be used with être than other verbs (Paloma Jeretič, p.c.). This is consistent with Palmer’s (1986) observation that subjunctive is losing ground in colloquial French.

12 A quote from Nicolás Maduro, accessed on YouTube on 7/9/18
Thus, as was shown for Romanian, CP-embedding constructions eliminate root interpretations in French as well. The modal embeds a subjunctive or even indicative CP, and bears no agreement with the subject of the embedded verb. Furthermore, as mentioned earlier, a non-agreeing form of pouvoir ‘can’, followed by a stativizing infinitival BE has grammaticalized into an epistemic modal adverb peut-être ‘maybe’ shown in (162).

(162) Peut-être que Marie est chez Anne.
    can.PRS.3SG be.INF QUE Marie be.3SG.PRS at Anne
    ‘Maybe Marie is at Anne’s.’ (epistemic, *root)

This section has shown that the Romance language family shows the same pattern observed for the Slavic languages – epistemic interpretations of Type A modal verbs can only be derived through CP embedding. In such biclausal constructions, only the embedded verb shows subject agreement, while the modal bears default φ-features. In monoclusal constructions, with Type A modal verbs, both the modal and the embedded verb agree with the subject, yielding subject-oriented root interpretations. BCS, Bulgarian and Macedonian within the Slavic language family have Type A modal verbs, and within Romance we have seen Romanian a putea ‘can’ leading a double life as a Type A and Type B modal verb. For Type B modal verbs, which embed infinitival complements, CP-embedding is not a necessary condition for epistemic interpretations, but it is still a suffi-
cient one. Spanish and French both have Type B modal verbs, and I have shown that such modal verbs are, as expected, ambiguous with infinitival complements, but lose their root interpretations when embedding a CP complement.

Before concluding this chapter, I will show some data from Greek, Maltese, Moroccan Arabic, Modern Standard Arabic and Hebrew. The first three of these languages have modal verbs (i.e., modal elements which, in morphosyntactic terms, behave like other verbs in the language) which embed agreeing complements. The prediction is that these modal verbs will behave like other Type A modal verbs I have shown, with epistemic interpretations requiring a lack of agreement on the modal verb and a biclausal structure. This is borne out – while not all modal verbs in these languages bear agreement, those that do can only be interpreted as root when they agree with the subject, and bear default agreement in epistemic contexts. Additionally, in some languages an overt complementizer follows epistemic uses of modal verbs.

I will also look at Modern Standard Arabic, which has Type A modal verbs that cannot be interpreted as epistemic, as well as a grammaticalized modal, as was shown for the Bulgarian trjabva ‘must’ and Macedonian mora ‘must’. I will show that it also affirms the generalization that CP-embedding is a sufficient condition for eliminating root interpretations of otherwise ambiguous modal elements. Finally, I will discuss Hebrew, in which modal verbs embed infinitival complements in root environments, but require CP embedding in epistemic environments.

Throughout the sections on Modern Greek (§3.3.2) and the Semitic languages (§3.3.3) I show that modal verbs are followed by an optional or obligatory BE when interpreted as epistemic, supporting Soare’s (2009) hypothesis that propositions embedded under modal verbs are stativized in order for the modal verb to be interpreted as epistemic.
3.3.2 Modern Greek

In Modern Greek\(^{13}\) there are two modal verbs that meet the criteria of being verbs and not being in a thematic relationship with the subjects (Palmer, 1986; Giannakidou, 2009; Staraki, 2013; Giannakidou & Staraki, 2013).\(^ {14}\) One is \textit{prepi} ‘must’, and the other is \textit{bori} ‘can/may’. Both of these verbs can be used in epistemic or root contexts.

\[(163)\]
\begin{enumerate}
\item a. O Janis bori na ine spiti prin tis 9.
\begin{tabular}{l}
the.NOM Janis.NOM can.IPF.3SG.PRS SBJV be.3SG home before the 9
\end{tabular}
\begin{tabular}{l}
‘Janis can/may be home before 9.’
\end{tabular}

\begin{tabular}{l}
((Maria Kouneli, p.c.) epistemic, root)
\end{tabular}
\item b. Ta pedιa prepi na trone fruta.
\begin{tabular}{l}
The children must.IPF.3SG SBJV eat.3PL.IPF fruit
\end{tabular}
\begin{tabular}{l}
‘The children must eat fruit.’
\end{tabular}

\begin{tabular}{l}
((Staraki, 2013), epistemic, root)
\end{tabular}
\end{enumerate}

Both modal verbs embed subjunctive complements introduced by \textit{na}. This particle was argued to be C, introducing subjunctive CPs, or Mood, heading MoodP but linked to C (Giannakidou, 2009: and references therein). In this sense, it is very similar to the BCS \textit{da} (see in particular Todorović (2012)). Like \textit{da\(_2\)}, the Greek \textit{na} also acts as a licensor for perfective present tense forms (PNP in terms of Giannakidou (2009)). Thus the minimal structure we need to assume for sentences such as (163) is as I argued for root versions of the BCS modal verbs. Staraki (2013) argues that, regardless of flavor, Greek modal verbs embed subjunctive CPs, which is consistent with what I propose for BCS epistemic modal verbs. I will show how the constructions disambiguate the flavors, and argue that for Greek, like BCS, CP-embedding is a requirement for epistemic, but not for root interpretations.

\(^{13}\)From this point on, I will be referring to it as Greek, as no discussion or mention of Ancient Greek will occur in this dissertation outside of this footnote.

\(^{14}\)Unlike what Giannakidou & Staraki (2013) do, I treat \textit{boro} and \textit{bori} as one here, since they are both the possibility modal, and have the same root.
Prepi ‘must’ only ever bears the default 3SG agreement morphology (compare (163b) to (164a)), although it can inflect for tense (164b).

(164)  

a. *Ta pedia prepun na trone fruta.
    The children must.IPF.3PL SBJV eat.3PL.IPF
    ‘The children must eat fruit.’  (Staraki, 2013: 2, (1.2a))

b. (O the.M.SG Jorghos) eprepe (o Jorghos) na fighi (o the.M.SG Jorghos must.3SG.IPF the.M.SG Jorghos SBJV leave.3SG the.M.SG Jorghos).
    Jorghos
    ‘Jorghos had to leave.’  [617, (434c)](Tomić, 2006)

When bearing past tense morphology, prepi ‘must’ only receives root interpretations. When combined with the future particle, it receives either root or epistemic interpretations, but as the Greek future particle itself contributes to epistemic interpretations (Giannakidou & Mari, 2017), I leave future aside and use past as a diagnostic.

In this sense, prepi ‘must’ behaves like Bulgarian trjabva and Romanian a trebui, both ‘must’. On the other hand, bori ‘can/may’, can bear subject agreement morphology, as well as tense. It is only ambiguous between epistemic and root readings when the subject is 3SG (163a). When the subject bears any other set of φ-features, bori ‘can’ bears subject agreement morphology in root readings only (165a), and is marked as default 3SG.PRS when epistemic (165b).

(165)  

a. Borun na ine sto grafio tus
can.PRS.3PL SBJV BE.3.PRS at.the.ACC office.ACC 3PL.GEN.CL
    ‘They can/have permission to be at their office.’  ((Maria Kouneli, p.c.)
    *epistemic, root)

b. Bori na ine sto grafio tus
can.PRS.3SG SBJV BE.3.PRS at.the.ACC office.ACC 3PL.GEN.CL
    ‘They may/might be in their office.’  ((Palmer, 1986: 26), epistemic, *root)
This is the same pattern observed for BCS. If both (165a) and (165b) rely on subjunctive CP embedding, it is unclear why the modal in the higher clause would agree with the subject in (165a), but not in (165b). The analysis I proposed for BCS, however, predicts these facts.

Furthermore, it also predicts that the intonation patterns for the two readings of the ambiguous sentence in (163a) would be different, if the epistemic sentence involves topicalizing the subject into the matrix CP. This is consistent with the judgments reported by Maria Kouneli (p.c.), according to whom the intonation patterns of (163a) are different in the epistemic vs. the root contexts, with a pause between the subject and the modal in epistemic contexts.

(166) \[
[TP [DP, o Janis] [ModP bori [Mod' t] [MoodP na [vP ine t i spiti prin tis 9]]]]
\]

(167) \[
[TOP [TP [DP, o Janis] ... [ModP bori [CP t] [C' [TP t] [T' na t i ine spiti prin tis 9]]]]]]
\]

Additionally, a CP-embedding analysis predicts that changing the word order to (168) makes the epistemic interpretation more prominent:

(168) Bori o Janis na ine spiti prin tis 9. can.IPF.3SG.PRS the.NOM Janis.NOM SBJV be.3SG home before the 9 ‘Janis can/may be home before 9.’ ((Maria Kouneli, p.c.) epistemic, root)

This follows straightforwardly from my analysis, where the default word orders for epistemic and root interpretations would be as (169) and (170) respectively.

(169) \[
[TP ... [ModP bori [CP [TP [DP, o Janis] [T' na t i ine spiti prin tis 9]]]]]
\]

(170) \[
[TP [DP, o Janis] [ModP bori [Mod' t] [MoodP na [vP ine t i spiti prin tis 9]]]]]
\]
Both word orders are ambiguous, however, but this is not ruled out by this analysis – the modal-initial word order can be achieved in root contexts by focusing the modal (171), and the subject-initial word can be achieved in epistemic contexts by topicalizing the subject out of the embedded CP (167).

(171) \[ \text{FocP borî} \text{ [Foc' [TP [DP, o Janis] [T' [ModP ... tî [MoodP na [vP ine tî spiti prin tîs 9]]]]]]} \]

An additional reason to posit a single TP in root, and biclausal CP-embedding structures in epistemic contexts comes from tense morphology. Modals bearing past tense morphology are interpreted as root only (172a), and they embed subjunctive complements. In epistemic contexts, past tense cannot be expressed on the modal, but can be expressed on the embedded verb (172b) and (172c).

(172) a. O Janis boruse na kani lathi.
   the Janis can.IPF.3SG.PST SBJV do.SBJV.3SG mistakes
   ‘Janis could make mistakes.’ (*epistemic, root (Maria Kouneli, p.c.))

   b. (O Janis) borî (O Janis) na ekane lathi.
      the Janis can.3SG.PRS the Janis SBJV do.3SG.PST mistakes
      ‘Janis may have made mistakes.’ (epistemic, *root (Maria Kouneli, p.c.))

   c. (O Janis) borî (O Janis) na exi kani lathi.
      the Janis can.3SG.PRS the Janis SBJV have.3SG do.PARTICIPLE mistakes
      ‘Janis may have made mistakes.’ (epistemic, *root (Maria Kouneli, p.c.))

The same is shown in the pair below. (173a) is used in epistemic contexts – let’s say we see that the horse has escaped, and I last messed with the rope it was tied down with. I didn’t untie it, or at least I definitely didn’t mean to. No one else went there. The embedded verb bears Tense, namely perfective past morphology (rather than subjunctive, or perfective nonpast in terms of Giannakidou (2009); Staraki (2013)). In root contexts (after much
trying, I was able to loosen the rope (173b)) the modal bears past tense, as well as the subject’s φ-features, and the embedded verb bears subjunctive morphology.

(173) a. Bori na xalarosa to skini
can.3SG.PRS na loosen.PFV.1SG.PST the rope
‘I may have loosened the rope.’ ((Maria Kouneli, p.c.) epistemic, root)
b. Boresa na xalaroso to skini
boro.PFV.1SG.PST na loosen.PFV.SBJV.1SG the rope
‘I was able to loosen the rope.’ ((Maria Kouneli, p.c.) epistemic, root)

Finally, when both epistemic and root modals are expressed in the same sentence, the epistemic obligatorily precedes the root (174), and is preferred in the initial position, preceding the subject.

(174) Bori o Janis na boruse na kani lathi
can.3SG.PRS the Janis SBJV can.IPF.PST.3SG do.SBJV.3SG mistakes
‘Janis may have been able/allowed to make mistakes.’
(epistemic > root (Maria Kouneli, p.c.))

There are many questions to be answered here, and Greek does not seem to behave as BCS does in embedding indicative CPs under epistemic modal verbs, but rather patterns more closely to what I have shown for Macedonian and Bulgarian, which both use the subjunctive Mood particle following the modal in both root and epistemic contexts. Staraki (2013) proposed that Greek modals embed CPs regardless of flavor, but it is not obvious how the same syntax would yield differing results when it comes to subject agreement and tense morphology on the modal and the embedded verb.

However, the overall pattern holds – the Greek boro ‘can’ is a Type A modal verb, bearing φ-features and embedding complements which themselves show agreement with the subject. As expected, it cannot express epistemic interpretations in such configurations, relying instead on CP embedding.
Lest this be a quirk of the Balkans, the next section steps outside of Indo-European in search of languages that allow multiple verbal elements to bear a single subject’s \( \phi \)-features. I examine data from Semitic languages, namely Maltese, Moroccan Arabic, Modern Standard Arabic and Modern Hebrew. The data suggest that Type A modal verbs in Semitic languages behave as those in Slavic and Romance. However, Hebrew presents a Type B modal verb which, contrary to expectations, behaves like a Type A modal verb in epistemic contexts. Additionally, I show that modal verbs in Semitic languages further support the hypothesis that a stativizing BE follows modal verbs in their epistemic uses.

### 3.3.3 Semitic

Maltese, a Semitic language, has a possibility modal verb *seta* ‘can’, which can be used in both root and epistemic contexts Vanhove et al. (2009). Root interpretations are more common, and in such contexts both the modal and the embedded verb show subject agreement. This is shown for \( 3SG.F \) in and \( 3PL \) subjects in (175) below.

\[
(175) \begin{align*}
\text{a.} & \quad \text{il-mara tieg}=i\text{h ma tista}=x \quad \text{issajjar} \quad \text{ghax marid}=a \\
& \quad \text{DEF-wife of-1SG NEG can.IPF.3SG.F-NEG cook.IPF.3SG.F because ill-F}
\end{align*}
\]

‘My wife cannot cook because she is sick.’ (Vanhove et al., 2009: 4 (1))

\[
\begin{align*}
\text{b.} & \quad \text{dawn kwazi setghu } \quad \text{kienu sunetti} \\
& \quad \text{DEM.PL almost can.PFV.3PL be.PFV.3PL sonnets}
\end{align*}
\]

‘These could almost have been sonnets.’ (Vanhove et al., 2009: 4 (4))

In epistemic contexts, *seta* ‘can’ is used only with *kien* ‘be’, both verbs bearing imperfective \( 3SG.M \) morphology. Following these, a complementizer may (Vanhove et al., 2009) but does not need to be used (176). The verb embedded under the modal agrees with the subject, as shown for \( 1SG \) and \( 3PL \) below.

132
This data suggests that Maltese \textit{seta} ‘can’ behaves as predicted for Type A modal verbs, in that it requires a biclausal structure to receive an epistemic interpretation.\footnote{There is an exception to this generalization in Maltese verbs \textit{g'andu}, \textit{kellu} and \textit{ikollu}, all ‘have’, which appear to be Type A modal verbs but are ambiguous between root and epistemic (weak) necessity interpretations regardless of the subject’s $\phi$-features Vanhove et al. (2009). Importantly, these are not exclusively modal verbs, but also express possession, meaning ‘have’.

\footnote{The examples Vanhove et al. give for epistemic use of modal verbs in Moroccan Arabic unfortunately have a 3SG subject, not appropriately demonstrating that they are invariable.} Similarly, Vanhove et al. (2009) show that in Moroccan Arabic, the possibility modal verb \textit{qdor} ‘can, may’ bears subject agreement, as does the verb it embeds, but only in root interpretations (177). In epistemic interpretations, Vanhove et al. (2009) report that it is invariably in IPF.3SG form (178).\footnote{The examples Vanhove et al. give for epistemic use of modal verbs in Moroccan Arabic unfortunately have a 3SG subject, not appropriately demonstrating that they are invariable.}

\begin{enumerate}
\item \textbf{a.} jista jkun ma niftakar=x
\textit{can.IPF.3SG.M be.IPF.3SG.M NEG remember.IPF.1SG-NEG}
\textit{‘I might forget.’} \quad (Vanhove et al., 2009: 5 (6))
\item \textbf{b.} Il-pulizija jista’ jkun li kienu fuq ix-xena ...
\textit{the-police can.IPF.3SG.M be.IPF.3SG.M that be.PL.PS on the-scene}
\textit{‘The police may have been on the scene ...’} \quad (Gatt & Portet, 2016: 4 (3))
\end{enumerate}
ever, it differs in epistemic interpretations in that it is, like Maltese *seta* ‘can’ obligatorily followed by *ykuun* ‘be.IPF.3SG.M’ (180).

(179) a. ka-yọss-ha taakul al-fromaaż
    TAM-lack.IPF.3SG.M-3SG.F eatIPF.3SG.F DEF-cheese
    ‘She has to eat cheese!’ (it’s good for her) (Vanhove et al., 2009: 15 (43))

b. xọss-u yomshi
    lack.PFV.3SG.M-3SG.M go.IPF.3SG.M
    ‘He has to go!’ (even if he doesn’t feel like it) (Vanhove et al., 2009: 16 (45))

(180) xọss-u ykuun mşa
    lack.PFV.3SG.M-3SG.M be.IPF.3SG.M go.PFV.3SG.M
    ‘He must be gone!’ (Vanhove et al., 2009: 16 (47)), epistemic

The obligatoriness of BE following both the Maltese *seta* ‘can’ and the Moroccan Arabic *xọss* ‘must’ supports the argument that epistemic uses of modal verbs are facilitated by the stativizing BE, as was seen overtly in BCS, but also in Spanish biclausal constructions with *deber* ‘must’. Additionally, the emergence of the complementizer *li* in Maltese (176b) supports a biclausal analysis of epistemic uses of the modal verb *seta* ‘can’.

Compare this to Modern Standard Arabic (MSA), in which the equivalent to the Maltese *seta* ‘can’, the Arabic *y-astat*iQ ‘can’ agrees with the subject (181), but only has root (ability) interpretations.

(181) y-astat*iQ-u al-t*iQ-alib-u ?an yaqra? al-kitab-a
    3SG.M-can-IND the-student.NOM SBJV read-SBJV the-book-ACC
    ‘The student can read the book.’ (Albaty, 2018)

The modal verb shows agreement with the subject, and embeds an agreeing subjunctive complement introduced by *?an*, which has been argued to be a subjunctive C head, but which Albaty (2018) argues is instead a subjunctive Mood head. Agreement on both the modal verb and the verb embedded under it suggests that the MSA *y-astat*iQ ‘can’ is of
the same type as the BCS root modal verbs moči ‘can’ and morati ‘must’, Bulgarian root mogę ‘can’, Macedonian može ‘can’ and mora ‘must’, Romanian a putea ‘can’, and Greek boro ‘can’. Unlike these modal verbs, however, y-astaf'i ‘can’ is not used in epistemic contexts in MSA.

Modal verbs which can be interpreted as epistemic or root, such as yajib ‘must’ and yumkin ‘may’, show default agreement and embed subjunctive, agreeing complements (Albaty, 2018). In this sense, these modal verbs behave like Bulgarian trjabva ‘must’ and Romanian a trebui ‘must’. As was seen in those languages, MSA sentences with the grammaticalized yumkin ‘may’ can be ambiguous between epistemic and root readings (182).

(182) yumkinu? ?an uydir-a fahd-u
may SBJV leave-SBJV Fahad-NOM
‘Fahad may leave.’ (epistemic, deontic (Albaty, 2018))

However, when instead of ?an, an unambiguous complementizer ?anna is used, only epistemic interpretations remain (183). This is the same pattern observed in Romanian with trebui că in §3.3.1.1, where CP embedding eliminates root interpretations.

(183) yumkinu? ?anna al-walad-a yaadara
may C the-boy-ACC left
‘The boy may have left.’ (epistemic, *root (Albaty, 2018))

A Type B language within the Semitic family would be Modern Hebrew, in which modal verbs yaxol ‘can’, tsarix ‘need’ and muxrax ‘must’ embed infinitival complements. These modal verbs can bear subject’s φ-features, but have defective paradigms (Berman, 1980). They can be interpreted as either root or epistemic, but ambiguity arises only in the present tense, and if the complement is headed by lixiyot ‘be.INF’ (184)
(184)  
| a. | Dan yaxol lihiyot ba-bait |
|     | Dan can    be.INF at-home |
|     | ‘Dan can be home’ |
|     | (Dromi, 1980: 100 (2a)), epistemic, root |
| b. | Dan tsarix lihiyot ba-bait |
|     | Dan need   be.INF at-home |
|     | ‘Dan ought to be home’ |
|     | (Dromi, 1980: 100 (2d)), epistemic, root |

For verbs other than *be*, agreeing *yahol* receives a root interpretation if the embedded verb is infinitival (185a). Epistemic interpretations are derived by embedding a CP (headed by *she* ‘that’) under a default *PRS yahol* followed by the infinitival *lixiyot* ‘be’ (185b). This biclausal strategy is available as an alternative to (184a) as well, see (185c).

(185)  
| a. | Dan yaxol la-avod ba-bait |
|     | dan can    work.INF at-home |
|     | ‘Dan may work at home.’ |
|     | ((Dromi, 1980: 104 (14a)) root, *epistemic) |
| b. | yaxol lihiyot she dan oved |
|     | can     be.INF C    Dan work.3SG |
|     | ‘Dan may be working.’ |
|     | ((Dromi, 1980: 101 (4a)) *root, epistemic) |
| c. | yaxol lihiyot she dan ba-bait |
|     | can     be.INF C    Dan at-home |
|     | ‘Dan can be home.’ |
|     | ((Dromi, 1980: 102 (5b)) *root, epistemic) |

Dromi (1980) reports that modal verbs interpreted as root can bear non-present Tense morphology (186a) and (186b), but in epistemic constructions, non-present Tense is only marked on the verb embedded in the CP headed by *C she* (187a). Note the constrast between Tense-marked root *yaxol* in (186b) and (187b) and the Tense-marked embedded verb in (187a).

(186)  
| a. | hu yaxol lalexet |
|     | he can    go.INF |
|     | ‘He can go.’ |
|     | ((Dromi, 1980: 102 (6a)) root, *epistemic) |
Further research is needed, but these data suggest that the same patterns are seen in Semitic languages that I discuss for Indo-European (Slavic and Romance) above.

Hebrew is somewhat of an outlier, possibly due to its modal verbs not being fully verbs in the syntactic sense (see Berman (1980); Netzer et al. (2007)). Despite embedding infinitival complements, as Type B modal verbs do, Hebrew modal verbs have epistemic interpretations almost exclusively in biclausal, CP-embedding structures (unless the only verb in the complement is be, see (184)).

However, it does support the argument that biclausal structures yield epistemic interpretations, as they do in Maltese and Moroccan Arabic. Additionally, the obligatoriness of the infinitival be following the modal verb in epistemic contexts in Hebrew patterns with what I have shown for BCS moći ‘can’.

3.4 Conclusions and future research

This chapter showed that the behavior of BCS modal verbs is not an idiosynracy of the language. I argued that, cross-linguistically, the syntax of the differences between epistemic and root interpretations of modal verbs depends on a small number of parameters pertaining to the modal verbs themselves. I suggest that the crucial factors are (a) whether
or not the modal verb bears unvalued $\phi$-features, and (b) the finiteness of the modal complement. Thus far, cross-linguistic conclusions about the syntax of modal verbs were largely made based on languages in which the modal complement is infinitival. In this chapter, I have taken initial steps toward making generalizations about modal verbs in languages in which this is not true.

I have shown that for modal verbs which embed infinitival complements and show agreement with the subject of the verb they embed, CP embedding is not a necessary condition for epistemic interpretations. It is, however, a sufficient one. I have shown that this is true in Russian (dolžno byť, §3.2), Romanian (poate că, §3.3.1.1) French (peut-être, il se peut que, §3.3.1.3), Spanish (se puede que, puede ser que, §3.3.1.2) and Modern Standard Arabic (yumkinu? ?anna §3.3.3). On the other hand, if both the modal verb and the embedded verb show agreement with the subject in root-compatible contexts, as is the case in BCS (Chapter 2), Macedonian (može §3.1), Bulgarian (moga, §3.1), Romanian (a putea, §3.3.1.1), Greek (boro §3.3.2) Maltese (seta, §3.3.3) and Hebrew (yaxol, §3.3.3) CP-embedding is a necessary condition for such modal verbs to be used with an epistemic interpretation.

Let us first look at a language which allows multiple agreement, such as BCS. If the modal verb bears unvalued $\phi$-features and embeds a subjunctive MoodP containing only the embedded verb and its arguments, the subject can cyclically A-move through its specifier, triggering agreement. In this configuration, the modal verb is interpreted as root.\footnote{With a possible exception to this generalization in Maltese verbs ghandu, kellu and ikollu, all ‘have’.}

For as long as the modal verb is merged within the same CP as the embedded verb and its subject, the modal’s unvalued $\phi$-features attract the subject, its specifier position being a valid stop during cyclic A-movement. When the modal verb bears unvalued $\phi$-features, but embeds a CP, the subject of the verb embedded inside the CP (it being a phase, Chomsky (2001)) cannot A-move through Spec, ModP. It can Topicalize out of the
CP, but it cannot value the modal’s φ-features. The modal verb, as a last resort, takes on default features (Preminger, 2011). This yields epistemic interpretations.

The data suggest that this CP-embedding may indeed be vP-embedding, headed by an optionally covert light verb *be*, which acts as a stativizer (Soare, 2009). From the syntactic perspective, this would mean that the syntax of a modal verb is constant. Modal verbs take one argument only, namely a vP/MoodP. The interpretation of the modal depends on the content of said argument – stativized CPs (a CP being a proposition) yield epistemic interpretations, whereas vP/MoodP containing only the embedded verb and its arguments yield root interpretations.

An alternative, in languages that allow multiple agreement, is for the modal verb to not bear φ-features, i.e. to be grammaticalized (like the Romanian *a trebui*, Bulgarian *trjabva*, or Greek *prepi*, all ‘must’). It then does not attract the subject of the embedded vP, which in turn does not need to move through its specifier on the way to Spec, TP. As the modal would not attract the subject, this also means that the modal verb being merged above TP could yield epistemic interpretations. This may involve a raising construction, such as the one proposed first by Ross (1969), or a single-TP monoslausal construction argued for by Brennan (1993); Marrano (1998); Cinque (1999); Hacquard (2006) and others. In the latter case, given that the linear order does not correspond to the proposed syntax (188), the epistemic modal is likely above TP in LF only, being otherwise merged in the same place as root modals are (for arguments in favor of all modals being merged below T, see for example Iatridou & Zeijlstra (2013)).

\[
(188) \quad [\text{ModP} \text{ may}_j [\text{TP} \text{ the children}_i [\text{T} \text{ T}_t [\text{AspP} \text{ t}_j [\text{vP} \text{ t}_i \text{ be home}]]]])
\]

Similarly, in languages where the modal complement is a bare infinitive, the modal verb agreeing with the subject is likely just a reflex of it being the highest verbal element, and
tells us nothing about the syntax. The construction proposed for epistemic modals in (188) has been proposed for such languages, with the root interpretations being derived from the modal verb being merged below T. In these languages, a CP barrier is not a requirement – the subject moves to Spec, TP to satisfy the EPP features of T, but it does not move through Spec, ModP. The modal does not have unvalued φ-features to attract the subject with. The only requirement the modal verb has in a language such as French, Spanish, or Russian, is a single non-finite propositional argument. A vP and a TP both meet that requirement.

Adopting a TP-embedding, raising analysis for epistemic interpretations of modal verbs in those languages that embed bare infinitives under modal verbs has one clear benefit, however. Having seen the stativizing be appear following modals cross-linguistically, we may want to propose that epistemic verbs embed propositions stativized by be. This would yield a syntax that corresponds to the linear order in epistemic contexts (189) and is consistent across modal flavors.

(189)  

I will not argue for either of these structures here, as more research is needed to determine the precise behavior of grammaticalized modal verbs/auxiliaries. My focus here is on the fact that, while a CP barrier is not necessary to eliminate root interpretations in these languages, a biclausal structure can still be used and is unambiguously epistemic. In such a sentence, the single argument of the modal verb is either a CP, or a non-finite vP headed by a stativizing light be, which in turn embeds a CP. The modal verb then shows default agreement, as it does in epistemic constructions with Type A modal verbs.

Impersonal use of modal verbs in epistemic contexts appears to be a step in the process of their grammaticalization. This process occurs in Type B languages as well –
the English modal auxiliaries *must*, *can* and *could* are all grammaticalized from Type B modal verbs which embedded infinitival complements (Roberts & Roussou, 2003). This process was discussed as upwards reanalysis, $V > v > T$. On the other hand, the upwards reanalysis proposed for the Greek *thelo* ‘want’ grammaticalizing into the future particle *tha* was $V > T > C$ (Roberts & Roussou, 2003). The latter process is similar to what is underway for the future marker in South Slavic languages, which is currently $T$ in BCS, but grammaticalizing into a particle in Bulgarian and Macedonian. This, in turn, is similar and seems to correlate with the process of grammaticalizing modal verbs in the latter two. The extent of the split between Type A and Type B modal verbs, and how their paths of grammaticalization may differ, is another question for future research.

Questions for future research also include expanding this typology further, in particular examining the stronger prediction about Type A modal verbs. The starting point would need to be languages which allow for multiple verbal elements to agree with the subject, and Gluckman et al. (2017) indicates that the Luhya family of Bantu languages may be of interest. If the analysis here is on the right track, I predict that there should be no modal verb (in Language) such that (a) it is possible, but not obligatory, for both the modal verb and the verb embedded under it to show agreement, AND (b) the agreeing form of the modal corresponds to epistemic, and the non-agreeing form to root interpretations.

Another question for future research involves the light *be* following epistemic modal verbs – is it optional, or always present and merely optionally covert? We have seen that some modal verbs (Maltese *seta* ‘can’, Moroccan Arabic *xass* ‘must’, Hebrew *yaxol* ‘can’, BCS *moći* ‘can’) require the presence of *be* in order for epistemic interpretations to be possible, whereas for others the overt *be* following the modal is optional and dependent on factors beyond the modal flavor itself (BCS *morati* ‘must’, Spanish *deber* ‘must’) and yet others are not followed by *be*. Another issue to examine from a language change per-
spective pertains to impersonal modal verbs followed by *be* being lexicalized as epistemic adverbs (English *maybe*, French *peut-être*).

Finally, and this is an issue I tackle in the following chapters of this dissertation, are the modal verb acquisition patterns similar across language types? That is, do the children learning Type A variable-flavor modal verbs, which require CP embedding for epistemic interpretation, acquire their various flavors in the same way as children learning Type B modal verbs, for which non-finite TP complements suffice? I examine this question by comparing BCS and English, first by looking at child language corpora in Chapter 4 and then experimentally in Chapter 5.
CHAPTER 4

How syntax conditions learning: A corpus study

4.0 Introduction

This chapter investigates whether empirical evidence supports the analysis laid out in the previous chapters. To that goal, I examine L1 acquisition of modal verbs. Children acquiring English first use functional modals (e.g., must, have to) with root meanings (e.g., abilities, obligations) around age 2, but only use them with epistemic meanings (i.e., knowledge-based inferences) around age 3 (Stephany 1979; Papafragou 1998; Cournane 2015a, i.a., cf. van Dooren et al. 2017). The question for this chapter is what accounts for this Epistemic Gap (EG). I present a corpus study of eight Bosnian/Croatian/Serbian (BCS) children and their maternal input. The main result is that BCS-learning children exhibit an EG which lasts until at least age 4, over a year longer than observed for English-learning children. I provide evidence that it is the language-specific syntactic differences between epistemic and root representations of modal verbs that best account for the EG.
(cf. Cournane (2015a)) rather than conceptual or input-frequency differences. In particular, I argue that while the epistemic use of modal verbs relies on TP-embedding in English, later acquired CP-embedding is a pre-requisite for the epistemic use of modal verbs in BCS, as predicted by the analysis presented in Chapter 2.

The structure of this chapter is as follows: in §4.1 I introduce the Epistemic Gap (EG), the hypotheses that have previously been suggested to account for it, and their predictions. The Conceptual Hypothesis (§4.1.1) argues that acquisition of epistemic uses of modal verbs is delayed due to the children’s conceptual development; the Grammatical Hypothesis (§4.1.2) argues that what the children lack during the EG is the necessary syntactic structure; and the Frequency Hypothesis (§4.1.3) proposes that low input frequency of epistemic uses of modal verbs is the reason they are acquired later than their higher-frequency root uses. Section §4.2 presents the SCECL (Serbian Corpus of Early Child Language, Andelković et al. (2001)) corpus, as well as the methods used to test each of the hypotheses. Section §4.3 presents the findings. In §4.3.1, I provide epistemic modal adverb use as evidence against a strict conceptual approach. In §4.3.2 I rule out the simple input frequency hypothesis, as it does not predict the BCS children’s usage patterns relative to their input. In §4.3.3, I show that the BCS children do not resolve their EG for up to 18 months after they demonstrate successful TP embedding. I then show that children do not show adultlike rates of CP-embedding before 4:00. In §4.4 I discuss these results, arguing that the findings provide evidence against the Conceptual Hypothesis, call for more research and adjustments to the Frequency Hypothesis, and support the grammatical hypothesis argued for by Cournane (2015a). With respect to the Grammatical Hypothesis, I further argue that the syntax of individual languages (see Chapter 3), and not just the ability to grammatically scope the modal over propositions, affects acquisition of epistemic uses of modal verbs. Finally, in §4.5 I discuss cross-linguistic predictions and theoretical consequences of a syntax-based account of the EG.
4.1 The Epistemic Gap

As stated in previous chapters, modal verbs in many languages, including English, are functional (i.e., auxiliaries or functional verbs) and express both major modal flavors: root (190a) and epistemic meanings (190b). Lexical modals express only one of the broad flavors of modality (see Traugott 2006; Hacquard 2013) - for example, probable is always epistemic and obliged is always root, as shown in (191).

(190)  a. Mary must do her homework.                      \textit{(root)}

       b. Mary must be doing her homework.                  \textit{(epistemic)}

(191)   It is \textbf{probable} that Mary is \textbf{obliged} to do her homework.

Longitudinal naturalistic acquisition studies regularly observe that root modal uses (e.g., desire, ability, permission) precede epistemic ones (Kuczaj & Maratsos 1975; Kuczaj 1982; Stephany 1979), establishing what is known as the Epistemic Gap (EG) (Cournane, 2015a). The EG refers to a period of time approximately a year long for English-learning children, ranging between 2 and 3 years old, during which children use functional modals with exclusively root meanings. In this chapter, I present novel results from a corpus study of eight children acquiring BCS and their maternal input, establishing that BCS-learning children exhibit a prolonged EG, relative to previously studied languages. As various explanations have been proposed for the EG, I address three competing hypotheses (see Cournane 2015a), assessing each of their predictions based on BCS data.

4.1.1 The conceptual hypothesis

The most widely accepted hypothesis to explain the EG suggests that children lack the conceptual abilities necessary to support epistemic meanings (Shatz & Wilcox 1991, Bartsch
The EG resolves once children conceptually develop epistemic thoughts, measured by use of epistemic forms. There are several issues with this hypothesis. First, it is circular in nature, as usage of epistemic modals predicts conceptual development prior to age 3 (not an age with a clear conceptual milestone, see De Villiers 2007), while undetermined conceptual development in turn predicts first epistemic uses (see also Cummins 2013). Additionally, non-linguistic studies have shown that infants make inferences about the intentions and desires of others, suggesting that children much younger than 3 years old may be able to conceptually entertain epistemic thought (see, for example, Warneken & Tomasello 2006; Tomasello & Carpenter 2007). Finally, there is a sampling error, as the conceptual hypothesis was built on functional modals, primarily English auxiliaries (e.g., must, can), and quasi-modals (e.g., have to, gotta) (Cournane 2015a) and similar modals cross-linguistically (e.g., Greek, Stephany 1979; French, Bassano 1996).

Functional modals do not form a complete set of modal forms in any language (see Portner 2009 for a detailed and thorough, if still incomplete, list). Furthermore, as shown in Section 4.1, they have variable meanings – must can be epistemic or root, while lexical modals such as probably are always epistemic.

Examining lexical modals that have dedicated epistemic meanings (see Rett & Hyams 2014), like adverbs, gives us more insight into whether children actually lack the necessary reasoning skills. Within the literature on first language acquisition, English-speaking children have been shown to use maybe and probably during their EG (O’Neill & Atance 2000, Cournane 2015a). Likewise, French-speaking children use the adverb peut-être ‘maybe’ at 2;00 (they never use functional modal verb pouvoir in epistemic contexts before 4;00; Bassano 1996), and Polish-speaking two-year-olds use the epistemic adjective chyba ‘probably’ (Smoczynska, 1993). These findings are evidence against the conceptual hypothesis, as they show that children may engage in epistemic thinking during their
EG, albeit their use of epistemic words is restricted to adverbs which only have epistemic interpretations.

In this study, I test whether the same is true for BCS-learning children. The conceptual hypothesis predicts modal flavor acquisition timelines to be similar across languages, as there is no reason to expect that the conceptual development of BCS-learning children differs from that of English-learning children.

### 4.1.2 The grammatical hypothesis

This hypothesis states that the EG occurs because children lack the grammatical representations needed to support epistemic interpretations of functional modal verbs (Cournane 2015a, also Heizmann 2006; De Villiers 2007). These interpretations are standardly argued to arise from syntactic structures more complex than needed for their root counterparts (e.g., Roberts 1985; Brennan 1993; Cinque 1999). The general consensus is that root modality is eventive while epistemic modality is propositional (e.g., Palmer 1986). In terms of specific syntactic structures, Cinque (1999) argues that epistemic modals are merged in Spec, Mod_{EpiP} above TP, while root modals merge as specifiers of different functional heads, all below T. Brennan (1993) argues for similar structures, with epistemic modals combining with propositional modal bases (TPs) and root modals combining with property modal bases (VPs). Crucially, Brennan argues that (a) the lexical entries for the two types of modal auxiliaries are not associated with their meanings in the lexicon, but rather with distinct syntactic structures, and (b) the meanings derive from the speakers’ intuitions—the link between the structures and meanings is usage-based.

Hacquard (2006, 2010: i.a.), follows Brennan with respect to (a), providing an alternative explanation for (b). She argues that, when modal verbs merge above TP, the modal’s event variable cannot be bound by Asp, so it gets anchored to the speech event,
yielding epistemic interpretations. Below T, this variable is bound by Asp and anchored to the VP event, yielding root interpretations. Following Hacquard 2006, I assume functional modal verbs are anaphoric to events. When below TP, the modal is locally bound by Aspect and interpreted as root. When above TP, the modal is bound by the speech act event (Percus, 2000) and interpreted as epistemic.

In Chapter 2, I argued that root modal verb constructions in BCS have the structure in (192) below, whereas epistemic modal verb constructions require CP embedding, and have the structure in (193). Note that (192) shows the subject preceding the modal, which bears agreement, and the lexical verb marked for perfective present, which is a form that needs a licensor in the same clause—in this case, the modal is the licensor. In (193), the modal precedes the subject and bears default 3SG agreement.\(^1\)

(192) \(\text{Djeca}_i \quad \text{mora-ju} \quad \text{da} \quad \text{t, po-jed-u} \quad \text{povrće} \quad \text{children.}^\text{NOM} \quad \text{must-3PL.PRS} \quad \text{DA} \quad \text{PFV-eat-3PL.PRS} \quad \text{vegetables} \quad \text{‘The children must eat the vegetables.’} \quad \text{(root)}\)

\(^1\text{See Chapter 2 for arguments that epistemic uses of BCS modal verbs require CP-embedding, based on verbal tense, aspect, agreement morphology, ellipsis, interactions with negation, and NPI-licensing.}\)
(193) Mora∅ (bi-ti) da djeca, t jed-u povrće
must-3SG.PRS be-INF DA children.NOM eat.IPfv-3PL.PRS vegetables
‘The children must eat the vegetables.’

Cournane (2015a) conducted a corpus study of Sarah (2;3-5;1, Brown 1973; corpus on CHILDES, MacWhinney 2000) to test Hacquard’s (2006) analysis of functional modal verbs in English. In English, modal auxiliaries like must take non-finite complements. Cournane tested whether the development of TP-embedding (representative of grammatically embedding propositions) correlated with first epistemic functional modals, and reported that Sarah’s first spontaneous epistemic functional modal is at 3;00 (must be gone), soon after her first to-infinitive form on the second verb at 2;10 (I want to see him), and first embedded pronominal subject at 2;11 (watch me do horsie). This finding is likely generalizable for English, as children show evidence of TP-embedding in the months leading up to 3;00 (De Villiers & Roeper 2016, i.a.) and previous research on the EG regularly reports first epistemic uses of functional modals around age 3 (Papafragou 1998, i.a.).

As epistemic interpretations of BCS modal verbs require CP-embedding, while CP-embedding is a sufficient (It must be that the system is wrong), but not a necessary condition for English modal verbs to get an epistemic reading,2 BCS provides an opportunity

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2English modal auxiliaries are grammaticalized modal verbs which take non-finite complements, which makes them Type B modal verbs in terms of Chapter 3.
to further refine the grammatical hypothesis. If representing epistemic meanings relies on being able to grammatically scope a modal above a proposition, (syntactically represented by at least a TP), the BCS-learning children will resolve their EG at the same time as the English-learning children resolve theirs, around 3;00 (Cournane 2015a, based on Hacquard 2006). However, if representing epistemic meanings depends on syntax per se, we predict that the BCS-learning children will not produce epistemic uses of modal verbs until they have started producing CP embedding. CP-embedding has been shown to occur in children’s speech around 4;00 cross-linguistically (De Villiers & Roeper 2016, i.a.), predicting a significantly longer EG for BCS than that observed for English.

4.1.3 The frequency hypothesis

In English, epistemic uses form only $\approx 8\%$ of all modal verb utterances (van Dooren et al., 2017), and under 5$\%$ as reported in sociolinguistic data (Tagliamonte & D’Arcy, 2007) and in maternal speech in child corpora (Cournane, 2015a)). The frequency hypothesis, proposed—but not explicitly tested—by both Shatz et al. (1983) and O’Neill & Atance (2000) proposes that the low usage rates of modal verbs in epistemic contexts in the input is the underlying cause of the children’s delayed production (EG). This is an important hypothesis, but to the best of my knowledge only Cournane (2015a) conducts a statistical analysis to test it, and even there only a sample of the input is tested. However, Cournane (2015a) shows, using a binomial test for concurrent acquisition (following Snyder 2007) that the EG in the speech of Sarah (Brown Corpus, Brown 1973) is not predicted by the input frequencies. While Sarah’s mother’s rate of epistemic use of modal verbs is low, it is present nonetheless, and Sarah’s rate of use of modal verbs in epistemic contexts remains both delayed and lower than expected far after she has resolved her EG.
In the current study, I test this hypothesis by examining all the maternal data in the Serbian Corpus of Early Child Language (SCECL) corpus (Andelković et al., 2001), a more systematic approach than most previous ones (see van Dooren et al. 2017). If input frequency is what leads to a delay in producing epistemic uses of modal verbs, I expect that a differential input frequency of modal verbs should yield a different rate of acquisition, while a similar input frequency should yield a similar rate of acquisition. Overall, as there should be no reason for significantly different cross-linguistic rates of “root talk” and “epistemic talk”, the frequency hypothesis predicts similar patterns of modal flavor acquisition cross-linguistically.

4.2 Methods

This study uses the CHILDES (MacWhinney, 2000) SCECL corpus (Serbian Corpus of Early Child Language; Andelković et al. 2001). The SCECL corpus contains data from eight children, four boys and four girls, aged 1;6 to 4;00. Four children (two boys and two girls) are from Belgrade, Serbia, and the other four are from Banja LUK, Bosnia and Herzegovina. All the children are from middle-class urban families with parents with at least a high-school degree. Recordings occurred between June 1998 and December 2000, once every two months for 90 minutes, with additional 30 minutes at 18, 24, 30, 36, 42 and 48 months. This yields a total of 128 recordings, 27 hours of recording per child, with 95,105 child utterances and 72,305 utterances by mothers, focusing on the mothers’ speech as representative of the input for each of the children.

For each child, I extracted all utterances containing all forms of moći ‘can’ and morati ‘must’ in the child’s speech, along with eight lines of preceding, and eight lines of following dialogue. This discourse context was carefully examined for all utterances to determine, based on contextual and grammatical cues, the interpretation of the modal.
If the discourse sampled was insufficient to determine this, the situational context in the original file (i.e., non-verbal elements coded in the corpus, such as child actions) was examined. All utterances containing moći ‘can’ or morati ‘must’ were coded as either root or epistemic. As a precaution, the data for 3 randomly selected children were coded by a different coder to check for inter-coder reliability.

For all eight mothers, I also examined the raw frequencies of moći ‘can’ and morati ‘must’. I extracted the utterances containing the collocations of mora (biti) da ‘must (be.INF) DA’ and može biti da ‘can be.INF DA’, context-examining them to determine modal flavor. I assumed that uses of moći ‘can’ and morati ‘must’ outside of these constructions have root meanings, as the adult speakers find them ungrammatical in epistemic contexts (see Chapter 2 and adult study in Chapter 5). This was a conservative choice, possibly underestimating the frequency of epistemic uses of modal verbs in the input. I compared these raw frequencies to those reported for English-speaking mothers in child corpora.

Additionally, I examined the raw frequencies of the epistemic modal adverbs, extracting the utterances containing both the possibility adverbs možda ‘maybe’ and valjda ‘possibly’, as well as the necessity adverb sigurno ‘surely, certainly’, in both the children’s and the mothers’ speech. Along with the children’s utterances themselves, I extracted eight lines of preceding, and eight lines of following dialogue, so I could examine the discourse context to make sure it was compatible with adultlike epistemic interpretations. If discourse context was insufficient, I examined the situational context as well, checking the transcripts for actions or gestures that suggest adultlike use of the adverbs.

For evidence of TP-embedding, I looked for V+da collocations, where DA is a mood marker, as shown in (192) (see Chapter 2, but also Browne 1986, Tomić 2004, Todorović & Wurmbrand 2016, i.a. for arguments for non-C DA in Mod/Mood). I chose htjeti ‘want’ as the verb, as English-speaking children use want early on in TP-embedding constructions (Shatz & Wilcox, 1991). As htjeti ‘want’ allows for nominal complements, and also to
avoid constructions in which its verbal complements may not be full TPs, I searched the corpora from the beginning (1;6) until sustained use of *htjeti*+DA was found.

In the strictest interpretation of the data, I would assume the following to be the minimum necessary evidence of CP-embedding: the embedding verb would need to be non-imperative, followed by an overt complementizer *DA*, with the embedded verb marked imperfective and having a subject distinct from the subject of the embedding verb, as exemplified in (194). While necessary, this evidence is not sufficient, as certain TP-embedding constructions meet those requirements (see (195), but also the discussion in Chapter 2, as well as Todorović & Wurmbrand 2016, i.a.). Given the nature of the task, I accept constructions such as (194) as evidence of CP-embedding in the strictest sense.

(194) *Kaže-m* da *jed-u* povrće.
    say-1SG.PRS DA eat.IPV-3PL.PRS vegetables
    ‘I say that they are eating vegetables.’

(195) *Hoć-u* da *po-jed-u* povrće.
    want-1SG.PRS DA PFV-eat.3PL.PRS vegetables
    ‘I want them to eat vegetables.’

In order to find evidence of CP-embedding in the children’s corpora, I examined the output of the *freq* command in CLAN (MacWhinney, 2000), noting the raw frequencies of *misliti* ‘think’, *reći* ‘say/tell’ and *kazati* ‘say/tell’ (typical CP-embedding verbs). I then found and extracted all utterances containing these verbs, with five utterances preceding and following the target. For all these utterances, I coded the complement type (null, nominal, adverbial, CP, other). For the utterances including *reći* and *kazati* ‘say/tell’, another complement type was a direct quotation complement. Here, as with the modal verb flavors, the data for three of the eight children were also coded by a different coder and checked against my code for inter-coder reliability. I finally examined the maternal
input as well, extracting all utterances containing *misliti* ‘think’, *reć* ‘say/tell’ and *kazati* ‘say/tell’, and coding them for complement type as was done for the child utterances.

Utterances were coded as having a nominal complement if the complement was *to*, ‘that’, *nešto* ‘something’, *šta* ‘what’ or an accusative-marked pronoun as in (196). Similarly, manner-wh questions (*kako* ‘how’) or utterances containing manner adverbs (*ovako* ‘this way’, *lijepo* ‘nicely’) as the only possible overt modifiers of the verb were coded as having adverbal complements. An example including both the child and the mother using this type of utterance is in (197) below.

(196)  
CHI: Re-ć(i) ću te tati²  
say-INF will.1SG.PRS you.2SG.ACC.CL dad.DAT  
‘I will tell on you to Daddy.’  
(LAZ, 2;8)

(197)  
MAJ: Mama ja sam žedna, mama!  
mom  I  am  thirsty  mom  
‘Mom, I’m thirsty, Mom!’

CHI: A tako se ne kaže.  
that-way SE NEG say.3SG.PRS  
‘We don’t say it that way.’  
(ANA, 3;02)

MAJ: Kako se ne kaže, ti meni tako kaže-š  
how SE neg say.3SG.PRS you.me.DAT that-way say-2SG.PRS  
‘What do you mean we don’t, you tell me that way.’

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This is not to imply that I argue that nominals, or adverbs, are complements to these verbs. However, all a child needs to have acquired in order to produce these constructions is adverbal adjunction or nominal complementation. Thus, while a child’s grammar may be adultlike at the point when they produce this, it is not necessarily so, and I cannot take this as a evidence of ability to produce CP-embedding.

Only clear spontaneous uses will be reported throughout this chapter. Repeating after adults was not considered spontaneous, and utterances such as (i) were not considered clear.

(i)  
BIL: ko je on?  
who is he

CHI: ne može.  
NEG can.3SG.PRS

BIL: šta ne može?  
what NEG can.3SG.PRS
give.IMP

CHI: a a o, daj.  
‘Who is he?’  ‘Can’t.’  ‘Can’t what?’  ‘Uh uh oh give.’
I coded the embedding verb as having a null complement when there was nothing overtly present in the sentence that could be analyzed as the complement of the verb (198), or if only the indirect object was present (199). These were usually imperatives, or utterances like Rekla sam ti! ‘I told you!’ In referring to these as null complements, I am not committing to their analysis as null complement anaphora (NCA) in terms of Hankamer & Sag (1976), although many could be syntactically analyzed as such. What matters here is that the child doesn’t need to have acquired kazati ‘say/tell’ as a CP-embedding verb to produce Kaži! ‘say.IMP’ – an analysis under which it takes no complement would suffice.

(198) CHI: ´cta[:šta] (j)e tu? aj(de) ti kadi[:kaži].
what be.3SG.PRS there? go-on you say.IMP
‘What’s there? You say (it).’

(199) CHI: sad ć[:ću] ja eća[:reći] mami.
now will.1SG.PRS I say.INF mom.DAT
‘Now I will tell Mom.’

I also coded utterances such as (200) below (said by an adult) as having null complements, as the complement is dislocated, and the entire utterance can be analyzed as a sequence of two sentences, with one containing the embedding verb with a null complement.

(200) MAJ: A koliko me voliš ni-s(i) mi rekla
and how-much me.ACC love.2SG NEG-be2SG.PRS me.DAT say.PPT.F.SG
‘And you didn’t tell me how much you love me.’

The direct quotation complements were not coded as CPs because the children’s early uses of reći and kazati ‘say/tell’ involve utterances like krava kaže mu ‘cow says moo’ and null complements, including non-imperative forms with null complements. Hence there is no reason to take utterances such as (201) as evidence that a child has mastered embedding CPs. Such utterances were, however, coded as a separate category (direct quotation).
Finally, I coded the following three types of utterances as having CP complements to the verb: first, the verb followed by a wh-question (202); second, the verb followed by a yes/no question (203); and finally the verb followed by a CP introduced by the complementizer DA (204). The first two types, especially if the matrix verb is imperative, as shown here, could be analyzed as mini-discourses consisting of two structurally unconnected CPs, and don’t necessarily require the child to be able to produce CP embedding. However, the goal was to err on the side of caution and find the earliest plausible CP-embedding, after which the search could be narrowed down to utterances containing DA, which cannot be analyzed as two freestanding CPs.

(202) CHI: kaži šta si jela.
   say.IMP what be2SG.PRS eat.PPT.F.SG
   ‘Say what you ate.’  
   (JEL, 3;00)

(203) CHI: reci meni jel ti [:imaš] [:žvaku]
   say.IMP me.DAT is-Q you have.2SG.PRS gum
   ‘Tell me, do you have gum?’  
   (ANE, 2;10)

(204) CHI: mama, Ija, Ija kaže da sam ja glupiča.
   mom Ija Ija say.3SG.PRS DA be.1SG.PRS.CL I dummy
   ‘Mom, Ija says that I’m a dummy.’  
   (ANA, 3;02)

The proportional frequency of each type of verb was calculated for both the children and the mothers based on the total number of utterances containing the verb divided by the total number of utterances in a given recording (TNU). The frequency of CP-embedding versus all other complement types was also calculated for both the children and the mothers. For each child, the first use of the verb was noted (following Stromswold (1989; 1990),
who showed that the age of first use is correlated with the age of regular use, and argued it is the most sensitive measure of acquisition we can use in doing research on spontaneous speech corpora). The first use followed by a repeated use in a following recording (based on Snyder’s (2007) first of repeated uses, FRU) was also noted. The same was done for the first use of CP-embedding, where applicable, and first repeated use of CP-embedding.

To test whether children produce CP-embedding structures as early as they produce say/tell, I followed Cournane (2015a) in using Snyder’s (2007) binomial test for concurrent acquisition. This tests the hypothesis that the proportional use of CP-embedding structures in a child’s speech after the first appearance is such that the prior zero rate of use is unsurprising. A non-null result refutes this hypothesis, suggesting that the delay is unexpected if the CP-embedding uses of say/tell were acquired concurrently with others.

The proportional frequencies of each of the modal verbs and adverbs were calculated by dividing the number of modalized utterances for each type of the modal by the total number of utterances (TNU). Where applicable, the proportional frequencies of the modal verbs in their epistemic uses were also calculated. From the proportional frequencies for each recording, the average proportional frequencies of both root and epistemic modal verbs were calculated.

To test whether the frequency of root use of modal verbs in the input conditions the children’s rate of root use of modal verbs, I first ran mixed-effects models separately for moći ‘can’ and morati ‘must’, with a fixed effect for the total number of child’s utterances, and a random intercept for subjects (individual children), testing if a child’s age is a significant predictor of the frequency with which they use modal verbs. The same was done for epistemic uses of modal verbs. After that, I ran mixed-effects models, again separately for the two verbs, testing whether the mother’s frequency of use of modal verbs with root and epistemic meanings is a significant predictor of the child’s usage frequency.
4.3 Results

Of the 95,105 total child utterances in SCECL, 2371 utterances contain modal verbs moći ‘can’ (2110) and morati ‘must’ (261). All eight children use modal verbs, at varying rates, starting from between 1;8 and 2;4, consistent with children learning other languages who first use modal verbal elements around age 2 (Papafragou 1998, i.a.). Early modal verb uses for BCS children tend to be one- or two-word utterances of moći ‘can’, which for all children precedes and is continuously used more frequently than morati ‘must’. First uses of the modal verb moći ‘can’ are given in (205)–(212) below for each child:

(205) DAR: ajde dohvati. CHI: ne može-m

   go-on reach.IMP  NEG can-1SG.PRS
   ‘Go on, reach it.’  ‘I can’t.’ (stretching to reach the turtle) (ANA, 1;8)

(206) CHI: ne možem

   NEG can.3SG.PRS
   ‘It can’t.’ (unable to stick the shovel in the ground) (DAC, 1;8)

(207) CHI: ne može

   NEG can.3SG.PRS
   ‘It can’t.’ (trying to put wheels on a toy car) (NIK, 1;8)

(208) NAD: to mora-∅      DA SE vrti-∅

   that must-3SG.PRS DA SE spin-3SG.PRS
   ‘That has to be spun.’ (spinning a toy helicopter rotor)

   CHI: je-l mogu xxx@a ovo vodimo?

   is-Q can.1SG.PRS this drive.1PL.PRS
   ‘Can I drive this?’ (grabbing the rotor) (LUK, 1;10)

(209) CHI: modem[mogu] ja.

   can.1SG.PRS I
   ‘I can do it.’ (trying to peel off another sticker) (ANE, 2;02)

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5Overgeneralized regular form of the irregular 1st singular mogu.
Crucially, no child utterances containing modal verbs were used in epistemic contexts, suggesting that the BCS-speaking children’s EG extends at least as late as 4;00. In this they differ from the English-speaking children, who resolve their epistemic gap and produce modal verbs in epistemic contexts a year earlier, around 3;00 (Papafragou 1998, Cournane 2015a, i.a.) or possibly even earlier than that (van Dooren et al., 2017). Maternal input contains 72305 utterances, 1958 (2.71%) of which contain moći ‘can’, while 494 (0.68%) contain morati ‘must’. Of these, 5 utterances with moći ‘can’ (all by 2 mothers), and 18 utterances with morati ‘must’ (all by 4 mothers) were used in epistemic contexts. Three of the eight mothers don’t have any utterances containing modal verbs in epistemic contexts. Importantly, these are the mothers whose total number of utterances (TNU) in the corpus is under 5200, while the other five mothers’ TNUs are above 9400. The comparison between the distribution of root and epistemic uses of the modal verbs between the children and their mothers is shown by verb, in Figure 4.1 for moći
‘can’ and in Figure 4.2 for morati ‘must’. Note that, due to the difference in the relative frequencies of the two verbs, the y-axes in the two plots are to two different scales.

![Possibility modal verb, by type](image1)

**Figure 4.1** – Root and epistemic uses of moć ‘can’ for mother-child dyads.

![Necessity modal verb, by type](image2)

**Figure 4.2** – Root and epistemic uses of morati ‘must’ for mother-child dyads.

### 4.3.1 Conceptual hypothesis

In line with what has been reported for the English-learning children’s use of *maybe* and *probably* (Cournane, 2015a), the BCS-learning children’s use of modal adverbs is summarized in Table 4.1.
Table 4.1 – Child use of epistemic modal adverbs *možda* ‘maybe’, *valjda* ‘possibly’ and *sigurno* ‘surely/certainly’.

<table>
<thead>
<tr>
<th>Child</th>
<th>First clear use (age)</th>
<th>Total number of uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUK</td>
<td>2;4</td>
<td>10</td>
</tr>
<tr>
<td>ANA</td>
<td>2;6</td>
<td>14</td>
</tr>
<tr>
<td>NIK</td>
<td>2;10</td>
<td>9</td>
</tr>
<tr>
<td>LAZ</td>
<td>3;02</td>
<td>2</td>
</tr>
<tr>
<td>JEL</td>
<td>3;6</td>
<td>1</td>
</tr>
<tr>
<td>DAC</td>
<td>3;8</td>
<td>3</td>
</tr>
<tr>
<td>MIL</td>
<td>4;00</td>
<td>1</td>
</tr>
</tbody>
</table>

All the children, but ANE, use epistemic possibility adverbs *možda* ‘maybe’ or *valjda* ‘possibly’, with LUK being the only child to use them both. The epistemic necessity adverb *sigurno* ‘surely/certainly’ is only used by two children, and not consistently, mirroring the pattern seen in modal verbs where the possibility verb *moći* is acquired before the necessity verb *morati*. For each of the children, the first (for JEL and MIL it is also the only) clear use of a modal adverb is shown in (213)-(219) below.

(213) CHI: ko lupa? NAD: ne znam. CHI: Đuđa *možda*.  
who thumps NEG know.1SG.PRS Đuđa maybe.  
‘Who’s thumping?’ ‘I don’t know.’ ‘Maybe Đuđa.’” (LUK, 2;4)

(214) MAJ: pa vjerovatno voda s bebine kos-e te pljusnu-la.  
well probably water off baby’s hair you.ACC splash-PPT.F.SG  
‘It was probably water from the doll’s hair that splashed you.’

CHI: jeste *valjda*.  
be.3SG.PRS probably  
‘It probably was.’  (ANA, 2;6)

(215) SBA: a ko će pobijedi-ti?  
and who will.3SG.PRS win-INF  
‘And who will win?’ *(setting the board up for a game of chess)*

CHI: *možda* ću ja.  
maybe will.3SG.PRS I  
‘Maybe I will.’  (NIK, 2;10)
A total of 41 utterances containing epistemic modal adverbs *možda* ‘maybe’, *valjda* ‘possibly’ or *sigurno* ‘surely/certainly’ were found. The rate of use ranges from one utterance per child (JEL, MIL) to fourteen for ANA, whose utterances include six containing the semi-fixed expression *nije valjda* which roughly translates to ‘It can’t be’ or a variant of that expression, with negation scoping over the modal adverb.

The children don’t fail to engage in probabilistic reasoning during the epistemic gap, they merely fail to engage in part of the grammatical strategy used by adults. These results show that children likely express epistemic modality in ways consistent with adult-like usage, they just don’t have modal verbs as part of their strategy to do so. This is
illustrated in Figures 4.3 and 4.4, where it can be seen that both the children and the mothers express epistemic modality, the difference being that the mothers employ both modal verbs and adverbs to do so. (NB: Root modal adverbs, such as *obavezno* ‘obligatorily’ are not included in the analysis.)

![Figure 4.3](image1.png)

**Figure 4.3** – Aggregate mean usage of possibility modal verbs and adverbs to express epistemic and root meanings.

![Figure 4.4](image2.png)

**Figure 4.4** – Aggregate mean usage of necessity modal verbs and adverbs to express epistemic and root meanings.
4.3.2 Frequency hypothesis

Since none of the children in the SCECL corpus resolve their EG for the duration of the corpus, I could not rely on Snyder’s (2007) binomial test for concurrent acquisition to test the frequency hypothesis. Instead, I assessed whether epistemic uses of modal verbs are even less frequent in the BCS input than in English, where they form less than 8% or fewer of all modal verb utterances (van Dooren et al., 2017; Cournane, 2015a; Tagliamonte & D’Arcy, 2007). If so, usage frequency could explain the cross-linguistic difference. Furthermore, if the lack of epistemic uses of modal verbs in the input is conditioning their absence in the children’s speech, the rate of root use of modal verbs in the input should also be expected to be conditioning the rate at which the children acquire it. As all the children have acquired root uses of modal verbs, this is a testable prediction, which I assess using mixed-effects models. Finally, if the children reach adultlike frequencies of non-epistemic uses of modal verbs, we could plausibly expect adultlike frequencies of their epistemic uses as well.

Each child corpus contains between 10,000 and 12,000 utterances, with one outlier at 17,000 utterances. The mothers in SCECL are, as mentioned early in this section, much more variable and range between 2,600 and 19,000 utterances. To assess whether mothers use modal verbs in epistemic contexts at rates similar to those reported for English adults (<5% of modal verbs, see Cournane (2015a), but cf. van Dooren et al. (2017) where the rate is about 8%), I calculated the proportional frequencies of epistemic modal verbs to total modal verbs. For the 5 BCS-speaking mothers who have any epistemic uses of modal verbs, the average proportion is 6.44% for morati ‘must’ and 0.8% for moći ‘can’.

\[ p = \frac{X}{X + Y}\]

where \( X \) is the number of times the verbs modal verbs are used in root contexts following the first use in an epistemic context, \( Y \) the number of times they are used in epistemic contexts following the first such use, and \( Z \) the number of times they are used in root contexts in the recordings prior to the first clear use in epistemic contexts.

NB: There may be epistemic uses of modal verbs by adults that were not found, so it is possible I am underreporting the rate of use by adults, see §5.3. Additionally, the minimum TNU for these 5 mothers...
The mixed-effects model for the children’s frequency of use of *močí* ‘can’, with a fixed effect for the total number of utterances and a random intercept for subjects showed that a child’s age is a significant predictor, increasing the frequency of use by 0.09% \((\chi^2(1)=33.697, p<0.0001)\), meaning that with each additional month, a child’s rate of use of possibility modals is expected to go up by about 1 in 1000 utterances. As each child has on average between 1100 and 2800 utterances per recording, this translates to between 2 and 6 additional utterances containing *močí* ‘can’ being expected in every recording.

Having shown that age is a significant predictor, I used age as a fixed effect, along with a random intercept for subjects, to see if the mother’s frequency of use of root possibility modal verb *močí* ‘can’ is a predictor of the child’s frequency of use, and found no significant effect. An increase by 0.1% in mother’s frequency of use increases the child’s frequency of use by 0.0095 ± 0.0053% \((\chi^2(1)=3.329, p=0.068)\).

A similar result was found for the root necessity modal verb, where a child’s age is a significant predictor, although the rate of increase was a negligible 0.021 ± 0.003% \((\chi^2(1)=33.552, p<0.0001)\). This is to be expected if we keep in mind that the model is applied to all the data (for the sake of uniformity), and that the children’s use of the necessity modal verb is delayed by several months compared to the possibility modal verb, which is also consistently used at higher frequencies. As was shown for *močí* ‘can’, the mother’s frequency of use of the root necessity modal verb does not have an effect on the child’s frequency of use of the same verb, where a mother’s rate of use going up by 1 in 1000 changes the child’s rate by 0.034 ± 0.05 \((\chi^2(1)=0.4934, p=0.48)\).

Just in case, I ran the same model with TNU as the fixed effect, and found a significant but minimal effect: an increase by 0.1% in mother’s frequency of use increases the child’s frequency of use by 0.016 ± 0.0057% \((\chi^2(1)=7.925, p=0.004)\). This means that for every additional 10 in 1000 mother’s utterances containing *močí* ‘can’, we can expect to see a child’s rate of use to go up by about 1 in 1000 utterances. Similarly (but less strongly and not significantly) for necessity modal verbs, a mother’s rate of use going up by 1 in 1000 increases the child’s frequency of use by 0.009± 0.0055% \((\chi^2(1)=3.11, p=0.077)\).
Taking the average proportional frequency across all mothers and all recordings to be the best proxy for adultlike use, I calculated the average adult frequency of root uses of modal verbs and epistemic modal adverbs. Figure 4.5 shows that, for the root possibility modal verb *moči* ‘can’, the average child proportional frequency shows a steady increase over time, reaching (and surpassing) the adultlike frequency of 0.03 (3% of all utterances) at the age of about 3;6.

![Figure 4.5](image)

**Figure 4.5** – Average child frequency of use of the possibility modals, compared to the ‘adultlike frequency’.

Compare that to Figure 4.6, where the child use of the root necessity modal verb *morati* ‘must’ is shown to be delayed in both the first appearance and in reaching the adultlike frequency (0.6% of all utterances), which it does at 4;00. Figures 4.5 and 4.6 also show the average child frequencies of the possibility and necessity epistemic modal adverbs.
Figure 4.6 – Average child frequency of use of the necessity modals, compared to the ‘adultlike frequency’.

4.3.3 Grammatical Hypothesis

In searching for evidence of TP-embedding, the starting point was the strictest definition: the inflected embedding verb *hteti* ‘want’, followed immediately by *DA*. While it is possible that earlier uses of TP-embedding exist, with infinitival complements or verbs other than *hteti* ‘want’, even with this definition we see that almost all children have a first of repeated uses (FRU)\(^9\) between the ages of 2;6 and 3;02. This is consistent with the reports of De Villiers & Roeper (2016), who state that children start using non-finite (V-to-V) complement clauses between 2;00 and 3;00, followed shortly by finite complement clauses. In BCS, the exceptions to this are MIL, whose first of repeated uses (FRU) occurs at 3;8 and ANE, who doesn’t have a repeated use across consecutive recordings, but has a first use

\(^9\)Based on Snyder’s (2007) first of repeated uses, FRU denotes the first use followed by a repeated use in the following recording.
at 3:00. In that recording, she uses the construction eight times, with different subjects, different verbs, and at distinct points in the recording. She uses the construction again two recordings later, and consequently in every other recording until 4:00. The first uses for all the children are shown in (220)–(227) below.

(220) CHI: ma nek Boro tamo ide-∅.
    EXCL let Boro there go-3SG.PRS.
    ‘Make/let Boro go there!’

    MAJ: pa Boro te samo snima-∅.
    well Boro you.ACC only record-3SG.PRS
    ‘Boro is just recording you.’

    CHI: (h)o´ć-u da ide-∅.
    want-1SG.PRS DA go-3SG.PRS
    ‘I want him to go.’

    (ANA, 2;6)

(221) CHI: (h)o´ć-u da pravi-m kobasicu!
    want-1SG.PRS DA make-1SG.PRS sausage
    ‘I want to make a sausage!’

    (LUK, 2;6)

(222) CHI: (h)o´če-∅ da jede-∅
    want-3SG.PRS DA eat-3SG.PRS
    ‘Wants to eat.’

    MAJ: (h)o´če-š da jede-š? CHI: Da.
    want-2SG.PRS DA eat-2SG.PRS Yes
    ‘You want to eat?’ ‘Yes.’

    (DAC, 2;6)

(223) CHI: on [ho´če-∅] da obuca.
    he want-3SG.PRS DA tear-up (baby talk)
    ‘He (baby brother) wants to tear it up.’

    (JEL, 2;10)

(224) CHI: mama, [ho´ć-u] da vidi-m kako da nađe-m[?].
    Mom, want-1SG.PRS DA see-1SG.PRS how DA find-1SG.PRS
    ‘Mom, I want to see how I can find…’

    (NIK, 2;10)

(225) CHI: [ho´če-š] da vidi-š koji bakin broj?
    want-2SG.PRS DA see-2SG.PRS which grandma’s number
    ‘Wanna see what grandma’s number is?’

    (ANE, 3;00)
If TP-embedding were a sufficient condition for the children to acquire epistemic uses of modal verbs, as Cournane (2015a) argues it is for children acquiring English, we would expect to see, as shown for Sarah, that the children use modal verbs in epistemic contexts shortly after they first use TP-embedding. For three of the children, no epistemic modal verbs emerge for 18 months following early uses of TP-embedding, and I take this to be an argument to reject the TP-embedding variant of the grammatical hypothesis.

In searching the corpus for early uses of *misliti* ‘think’, I found a total of 33 utterances, 17 of which have CP complements (based on the criteria described in §5.3). Two children produce no such utterances, and three produce one utterance each, at 3;10 or 4:00. Only two children have repeated uses - NIK (at 3;02 and 3;4, but then no uses until 4;00) and LUK (3;10 and 4;00). It is important to note, however, that *misliti* ‘think’ is not merely comparable to epistemic uses of modal verbs in virtue of being a CP-embedding verb, but also in requiring the use of the same cognitive abilities (epistemic thought). Hence I only note this finding here, without further analysis.

When it comes to *reči* and *kazati* ‘say/tell’, no children produce these verbs before 2;00, and no child utters CP-type complements before 2;4. When CP-type complements (even as broadly defined as they are in §4.1.1) do appear, the rate of use of such constructions stays at an average of 16% of all utterances containing *reči* and *kazati* ‘say/tell’, which form 2-4% of all utterances. The mean frequency of such constructions across all utterances is 0.04% for the children, whereas for mothers it is 0.7%. The mothers’ rate
of use of CP-complement constructions is 23% on average, ranging between 12–42% of a mother’s utterances containing reči and kazati ‘say/tell’. This is illustrated in Figure 4.7 below, where each pair of bars shows the average proportional frequency for children (blue bars on the left) and mothers (yellow bars on the right) at a particular age of the children. The darker top portion of each bar, if present, represents the use of CP complements, broadly defined.

![Figure 4.7 – Use of reči/kazati ‘say/tell’ by complement type.](image)

Table 4.2 below illustrates, for each child, a timeline going from the first use of reči/kazati ‘say/tell’ to the first repeated use of a CP-embedding construction with those verbs, which only four of the eight children had. Even among those four children, ANE has a repeated use at 2;8 (followed by 2;10), but follows that with another use only at 3;6, and LUK has consistent use with one or two utterances at each recording between 2;6 and 3;4, and then no later utterances. In Table 4.2, FRU (first of repeated uses) denotes the time of an utterance containing the verb reči or kazati ‘say/tell’ followed by another
such utterance in the following recording. CP-embedding FRU denotes the time of an utterance containing those verbs with a CP complement (as described in §5.3) followed by another such utterance in the following recording. CP-embedding TNU is the total number of such utterances, with the bracketed number being the total number of utterances containing CP-embedding narrowly defined.

Examining CP-embedding narrowly defined (i.e. only utterances such as (204), repeated below as (228) to the exclusion of those such as (202) and (203), repeated below as (229) and (230)), JEL’s first use is at 3;8, and she does not have a repeated use, whereas ANE’s first use (and first of repeated uses) is at 2;8, with only ANA and LUK’s uses being as reported in Table 4.2.

(228) CHI: mama, Ija, Ija kaže da sam ja glupača. mom Ija Ija say.3SG.PRS DA be.1SG.PRS.CL I dummy ‘Mom, Ija says that I’m a dummy.’ (ANA, 3;02)

(229) CHI: kaži šta si jela. say.IMP what be2SG.PRS eat.PPT.F.SG ‘Say what you ate.’ (JEL, 3;00)
For each child who shows repeated uses of CP-say, I ran a binomial test for concurrent acquisition\(^\text{10}\) (Snyder, 2007) to test if the rate of use of CP-embedding “say” is expected to be zero before the first use, given the rates of use of non-CP-embedding “say” before the first CP-embedding use, and the rates of use of both CP-embedding and all other uses of “say” after the first use of CP-embedding. For all the children that show repeated uses of CP-embedding “say”, the test showed that the likelihood of zero use given the assumption of concurrent acquisition to be \(p<0.0001\).

4.4 Discussion

I have shown that the epistemic gap (EG), which ends around 3;00 in English-speaking children, is protracted in BCS-speaking children, who do not use modal verbs in epistemic contexts until sometime later than 4;00. In testing the conceptual hypothesis, the results for the BCS-speaking children have been shown to be aligned with the results reported for English, French, and Polish-speaking children (O’Neill & Atance 2000, Cournane 2015a, Bassano 1996, Smoczynska 1993). Seven of the eight children spontaneously use možda ‘maybe’, valjda ‘possibly’ or sigurno ‘surely/certainly’ in contexts compatible with epistemic reasoning. The frequencies of use are very low, and for some children we do not see a repeated use, but a qualitative analysis of the context of each use shows that the children use epistemic modal adverbs in adultlike contexts.

\(^{10}\)\(p=(X/(X+Y))^Z\), where \(X\) is the number of times the verbs reći/kazati ‘say/tell’ are used with a non-CP complement in the recordings following the first use of those verbs with a CP complement, \(Y\) the number of times they are used with CP complements in the recordings following the first such use, and \(Z\) the number of times they are used with non-CP complements in the recordings prior to the first clear use of those verbs with a CP complement.
The BCS-learning children’s use of epistemic modal adverbs is comparable to that reported for English-learning children, where Sarah was reported to first use *maybe* at 3;02, while Eve, Adam, Naomi and Abe first use epistemic modal adverbs at 2;01, 2;6 and 2;9 (Cournane, 2015a). Yet, despite the similar patterns of acquisition of both root modal verbs and epistemic modal adverbs between the English- and the BCS-acquiring children, differential patterns of acquisition of epistemic modal verbs are observed. The English-speaking children start producing constructions with epistemic uses of modal verbs between the ages of 3;00 and 3;6, while the BCS-speaking children do not produce any such constructions before 4;00. Importantly, adopting the conceptual hypothesis pushes us into a difficult corner if we need to explain how and why the cognitive development of children acquiring BCS would be delayed by a year as compared to their English-speaking counterparts.

To reiterate, I have shown evidence that BCS-speaking children likely do engage in probabilistic thinking during their epistemic gap, merely using elements which have invariable meanings. Obviously, assessing how adultlike a child’s reasoning is based on examining the corpus data is difficult, and it is still possible that the children’s probabilistic reasoning skills are not developed. However, what these results clearly show is that there is a marked difference between the epistemic uses of modal adverbs, which only have epistemic interpretations, and the epistemic uses of modal verbs, which have variable meanings. Before moving on to discussing the grammatical hypothesis, it is important to note a difference between the English and the BCS epistemic modal verbs and their acquisition.

When the English-speaking children resolve their epistemic gap, the first modal verb they use in epistemic contexts is *might* for three out of the four children Cournane (2015a) examined. The fourth child’s first epistemic use of a modal verb employs *must*. *Might* has largely epistemic interpretations in English (Hacquard & Wellwood, 2012; van
Dooren et al., 2017), and the uses of must in adult English are mostly epistemic (Tagliamonte & D’Arcy, 2007; van Dooren et al., 2017). van Dooren et al. (2017) also report early child epistemic uses of modal verbs to mostly employ might, must, and may, which is also largely used with epistemic interpretations by adults. The BCS-acquiring children have no modal verbs in the input that are not predominantly used with root interpretations, and this may be a contributing factor in extending their epistemic gap.

Additionally, while the proportional frequencies of the epistemic uses of the modal verbs are low in English (van Dooren et al. (2017) report about 8%, Tagliamonte & D’Arcy (2007) under 5%), they are even lower in the SCECL corpus, where just under 1% of modal verbs are used in epistemic contexts. While morati ‘must’ is used in epistemic contexts at a rate comparable to that seen in English (6.44%), it is also the modal verb that children start producing later than moći ‘can’, and produce less frequently, with only 261 total utterances. Of course, it bears repeating that the SCECL mothers’ frequency of epistemic uses was likely underestimated – for example, I did not include conditional forms such as moglo bi ‘can.PPT.N.SG be.AOR.3SG, which can also be interpreted as epistemic, although likely due to conditional morphology (see §2.2.1 and §3.1.2.2). Children’s conditional forms were examined (only three were uttered, none in epistemic-compatible contexts).

Overall, while the impact of the input frequency cannot be dismissed, it seems unlikely that similarly low proportional frequencies of the epistemic uses of the modal verbs by BCS- and English-speaking adults would differentially predict the children’s time of acquisition of the said constructions by as much as a year (even longer if we consider the findings of van Dooren et al. (2017)). Denser BCS child language corpora and more detailed inspection of BCS adult corpora could help us better understand the impact of input frequencies.

Due to the absence of epistemic uses, it was not possible to use the binomial test for concurrent acquisition of epistemic and root uses of modal verbs, a test that Cour
(2015a), following Snyder (2007), used on Sarah’s English corpus (Brown, 1973). Instead, to test the impact of the input, I tested the frequencies of the root uses alone. This has shown that the mothers’ usage frequencies alone cannot account for the rate at which the children acquire root uses of the modal verbs. If the frequency is not the best predictor of the rate of acquisition for the root uses of the modal verbs, it is harder to argue that frequency alone drives the delay in acquisition of their epistemic uses. Additionally, the children were shown to not just acquire root uses of modal verbs, but to have reached adultlike frequencies of use for both the possibility and the necessity modal verbs, which makes the complete absence of epistemic uses conspicuous.

In terms of the grammatical hypothesis, in its unmodified form it would suggest that the BCS-acquiring children are delayed in acquiring TP-embedding, seeing as their epistemic gap lasts until at least 4;00. I have shown evidence to the contrary, i.e., that they acquire TP-embedding constructions as early as their English-speaking counterparts do. A modified grammatical hypothesis, which takes into account the syntactic differences between English and BCS epistemic modal verbs, can account for the data, as the milestone for acquiring CP-embedding is around 4;00. The results suggest that only half of the children produce CP-complements, which could account for the protracted EG if having acquired CP-embedding is a prerequisite for using modal verbs in epistemic contexts. Granted, it is not clear why the four children who do have repeated uses of CP-embedding constructions do not use modal verbs in epistemic contexts. Again, denser corpora may prove revealing.

4.5 Future research and conclusions

Further cross-linguistic work in both syntax and L1A can help further differentiate between the extant hypotheses to account for the EG. The conceptual hypothesis should
predict that, in any language that has both epistemic and root modal verbal elements, the epistemic uses should be delayed until about 3;00. A modified frequency hypothesis should predict that the acquisition of epistemic uses of modal verbal elements will be conditioned by the relative frequency of epistemic uses of such elements in the input. This would mean that epistemic uses of elements which have (almost) exclusively epistemic uses, such as the English *might*, will be acquired earlier than elements which have primarily root uses, such as the BCS *moći* ‘can’. The grammatical hypothesis should predict that the acquisition patterns would be different depending on the syntactic patterns in the language being acquired, including whether the variable meaning modal verbal elements are verbs or auxiliaries. The data from Bassano (1996) suggest that this may be the case, as epistemic uses of *pouvoir* ‘can’ are not acquired before 4;00 in French, while *devoir* ‘must’ is not used epistemically before 3;3, and only three times after that (at a proportional frequency of 0.05%).

The research presented here also provides arguments against the hypothesis that epistemic modal adverbs and epistemic modal auxiliaries and verbs are all generated as specifiers of the same functional projection (Cinque, 1999). It is unclear why a child who is able to represent verbal elements elsewhere in the syntax, and also able to represent Cinque’s (1999) Mod_{EpiP}, would be able to represent adverbial elements as specifiers of this functional head, but not verbal ones. Unlike the syntactic approach presented here, and other approaches which argue that the position of variable-meaning modals conditions their interpretation (Brennan, 1993; Hacquard, 2006: i.a.), Cinque’s (1999) approach states that it is the epistemic interpretation of modal elements that conditions their position, thus predicting that children should acquire epistemic modal verbs and adverbs concurrently, contrary to fact.

Another avenue for research is determining why it is that some of the children in the SCECL corpus seem to show evidence of having acquired CP-embedding, but no
evidence of using modal verbs in epistemic contexts. One possibility could be that at least some of the children, based on the surface-level similarities between TP- and CP-embedding structures (discussed in §5.3), first use these verbs as TP-embedding verbs, re-analyzing them as CP-embedding once they have acquired the necessary structure. This could account for LUK’s gap in clause-embedding use of these verbs, where he shows such use between 2;6 and 3;4, but not after that, and ANE’s uses at 2;8 and 2;10, followed by a gap until 3;6. Both TP-embedding and CP-embedding constructions involve an inflected embedding verb followed by DA, and both can involve having distinct subjects of the two verbs. Future research should be directed at making precise the distinctions between TP- and CP-embedding, and experimental work to determine the age of acquisition of each of those types of structures.

An experimental study with the goal of examining the children’s understanding of epistemic (CP-embedding) and root (monoclausal) uses of modal verbs is presented here in Chapter 5. In that study, I examine the prediction of the grammatical hypothesis, testing whether children attend to grammatical cues to determine the meaning of the BCS modal verb morati ‘must’.
5.0 Introduction

In this chapter, I present an experimental study in first language acquisition (L1A) in which I investigate whether children attend to the grammatical cues from agreement, word order and aspect to determine the meaning of the modal verb *morati* ‘must’.

The morphosyntactic differences between constructions compatible with epistemic as opposed to those compatible with root interpretations in BCS are discussed in detail in Chapter 2. I have shown that BCS modal verbs, when they are used in epistemic contexts, employ a biclausal CP-embedding construction. On the other hand, contexts compatible with deontic, circumstantial, teleological and ability meanings all employ smaller, monoclausal constructions. The differences in the acquisition patterns between the root and epistemic modal flavors, when it comes to the BCS-learning children’s spontaneous production, are discussed in Chapter 4. The children have been shown to begin producing
the possibility and the necessity modal verbs in root contexts around 2;0, and use them at close to adultlike rates in adultlike contexts by age 3;0. However, unlike the English-learning children who use functional modals like *must* and *can* only in root contexts until the age of 3;0 (Stephany, 1979; Papafragou, 1998; Cournane, 2015a: i.a.), when they first start using them in epistemic contexts (cf. van Dooren et al. (2017)), the BCS children’s corpus data contains no uses of modal verbs *morati* ‘must’ or *moći* ‘can’ in epistemic contexts before the age of 4;0 (end of SCECL corpus, (Andelković et al., 2001)).

If using modal verbs in epistemic contexts in BCS relies on CP-embedding, this delay is consistent with what is reported for L1A patterns in other languages (De Villiers & Roeper, 2016). We see evidence suggesting that children acquire TP-embedding around the age of 3;0, while CP-embedding is acquired around 4;0. I have shown in Chapter 4 that this appears to be the case for BCS-learning children as well. In this chapter, I focus on children’s modal verb comprehension to see whether children use the morphosyntactic cues to modal flavor in the same way as adults do.

Prior studies done with English-learning children (Heizmann, 2006; Cournane, 2015a; Cournane & Pérez-Leroux, in prep.) suggest that they may use morphosyntactic cues from Aspect on the embedded verb to differentiate between root and epistemic interpretations already at 3;0 years old. However, by 5;0 they prefer epistemic interpretations of *must* regardless of structural cues. Here I use the picture-choice task from Cournane (2015a) and Cournane & Pérez-Leroux (in prep.) with BCS-learning children, as BCS can help us distinguish between the hypotheses that were proposed to account for the English-learning children’s results.

One hypothesis states that comprehension behaviors are driven by input patterns – English-learning children prefer epistemic interpretations of *must* due to *must* being primarily epistemic in the input, as shown by van Dooren et al. (2017). This predicts that
BCS-learning children should prefer root interpretations of morati ‘must’, as it is overwhelmingly used with root interpretations in the input (>96% of all uses, see Chapter 4).

Contrary to that, my hypothesis is that morphosyntactic cues are stronger than input frequency in determining modal flavor. We know from theoretical work that tense and aspectual morphology are crucial in differentiating the modal flavors (see Chapter 2 and references therein). However, the English-learning children’s results are equally well captured by the fact that the structural cues to modal flavor in English are not interpreted categorically. Consider the pair of sentences in (231). The sentence in which the embedded verb is aspectually marked (231a) is typically interpreted as epistemic, while the sentence in which the modal embeds a bare infinitive (231b) is typically interpreted as root.

(231) a. Michelle must be swimming.
    b. Michelle must swim.

Both of these generalizations have exceptions. The embedded verb can be aspectually marked while the modal is interpreted as deontic: if patrons in the lap lanes must (at all times) be swimming laps, and Michelle is in the lap lane, then ‘Michelle must be swimming’, deontically. On the other hand, if Michelle has swimmer’s shoulders, then ‘Michelle must swim’, epistemically. These are exceptions (van Dooren et al., 2017), but they exist and may complicate the mapping from structure to flavor for English learners. In BCS, this problem does not exist. Modal verbs cannot bear agreement morphology and get interpreted as epistemic, and ambiguous sentences are restricted to those with 3SG subjects.

I show in this chapter (§5.1) that BCS-speaking adults use the morphosyntactic cues discussed in Chapter 2 to distinguish the modal flavors categorically. The constructions for epistemic as opposed to root modal flavors differ in word order, aspectual
morphology on the embedded verb and agreement morphology on the modal verb with both the necessity modal verb *morati* ‘must’ and the possibility *moći* ‘can’ (compare (232a) and (232b) to (232c) and (232d)). With the latter, an additional element (infinitival *biti* ‘be’) is present when the modal is used in epistemic contexts (compare (232c) and (232d)). In order to have the stimuli be minimally different across conditions, only *morati* ‘must’ is used in this study.

(232) a. Dječaci mora-ju da od-u.
   boys must-3PL.PRS DA go.away.PFV-3PL.PRS
   ‘The boys must go away.’

b. Dječaci mögū da od-u.
   boys can.3PL.PRS DA go.away.PFV-3PL.PRS
   ‘The boys can go away.’

c. Mora-∅ da dječaci odlaz-e.
   must-3SG.PRS DA boys go.away.IPF-3PL.PRS
   ‘The boys must be going away.’

d. Može biti da dječaci odlaz-e.
   can.3SG.PRS be.INF DA boys go.away.IPF-3PL.PRS
   ‘The boys may be going away.’

The basic assumption of the study is the syntax of epistemic vs. root interpretations of BCS modal verbs proposed in Chapter 2. Assuming that the BCS-learning children are like their English-learning peers in first producing adult-like CP-embedding utterances around the age of 4;0 (De Villiers & Roeper, 2016), I expected that children younger than 4;0 years old do not produce sentences with the syntactic structure needed to support epistemic interpretations (i.e., CP-embedding). On the additional assumption that not producing also means failing to comprehend the relevant structures, the children who hear biclausal sentences such as (232c) are expected to reanalyze them to incorporate *morati* ‘must’ into a monoclausal structure. This would possibly result in them interpreting (232a) and (232c) equally, assigning root meanings to both. Having begun to pro-
duce CP-embedding at about 4;0 years old, the children’s interpretations of modal flavors should become more adultlike, becoming fully so by the time the children are 6 years old.

Viewed another way, I predict that 3-year-olds should have a very high accuracy rate for monoclausal sentences (choosing “root” pictures) and a very low “accuracy” rate for biclausal ones (still choosing “root” pictures). For 6-year-olds, we expect adultlike performance, with high accuracy rates for both.

The results are surprising, and show that despite the above-described differences in the most frequent input meaning between the English must and the BCS morati, as well as the differences in the type of structural cues and categoricity, both children and adults behave similarly with morati and must. Adults in both languages allow for apparent epistemic interpretations of root sentences, and the children show a non-adult epistemic bias by the age of 5 (§5.4). As both the input and the morphosyntactic cues differ in the two languages, I argue that a pragmatics-based account captures the cross-linguistic results, for both the children and the adult controls. Deontic uses of modal verbs have invited inferences (Traugott & Dasher, 2001) to ‘wide scope generalized deontic necessity’. The existence of this inference from deontic to epistemic necessity and certainty was proposed as an explanation of the historical change in the meaning of must. I argue that the existence of such inference (X must φ → X is φ-ing) explains cross-linguistic child patterns and adult behavior (§5.5).

The chapter proceeds as follows: I first briefly present a grammaticality judgment study I did with adults §5.1, to demonstrate that adults are categorical in their choice of constructions to use in epistemic as opposed to deontic and circumstantial contexts with both the possibility and necessity modal verbs in BCS. Following this I present a stimulus norming study (§5.2) which was done with adult participants prior to conducting the L1A study on modal flavor. Then I present the methods for the study itself (§5.3), followed by results (§5.4) and discussion (§5.5).
5.1 Adult grammaticality judgment study

In order to test the hypothesis that adults are indeed as categorical in their interpretations of sentences containing the modal verbs *morati* ‘must’ and *moći* ‘can’ as I present in Chapter 2 of this dissertation, I conducted a questionnaire study with adult native speakers of BCS. This section briefly presents that study: the results show that adults are, as predicted based on the data and arguments presented in Chapter 2, categorical in their choices. In contexts compatible with epistemic interpretations, only non-agreeing modal verbs can be used, perfective forms of embedded verbs cannot be used, and modal verbs are obligatorily (in the case of *moći* ‘can’) or optionally (*morati* ‘must’) followed by infinitival *biti* ‘be’. In deontic and circumstantial contexts (both root), agreement on the modal is obligatory, perfective forms of embedded verbs are preferred, and infinitival *biti* ‘be’ never follows the modal.

5.1.1 Methods

The questionnaire is based on contexts from Vander Klok (2014), adapted to the cultural context. It was distributed as a grammaticality judgment questionnaire. Each subject read thirty-six different mini-stories setting up the context, rating between three and six sentences in each. Twelve contexts were fillers and contained no modal verbs.¹ Another twelve were testing questions not being dealt with here (e.g. the choice between weak and strong necessity, or between permission expressed by *moći* ‘can’ and *smjeti* ‘dare’).

The twelve contexts being analyzed here were divided as follows: in six, the sentences to be rated contained the necessity modal verb *morati* ‘must’ and six contained the

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¹As defined in Chapter 2. They did, however, contain *željeti* ‘want’, as well as *nastaviti* ‘continue’ and *tvrditi* ‘claim*. *Željeti* ‘want’ takes an external argument, which makes it syntactically not a modal verb as defined in Chapter 2.
possibility modal verb *moći*. For each force type, there were two epistemic-compatible contexts, two deontic-compatible ones and two contexts compatible with a circumstantial interpretation. This is represented in Table 5.1.

<table>
<thead>
<tr>
<th>Flavor</th>
<th>Force</th>
<th>Possibility</th>
<th>Necessity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epistemic</td>
<td>2 (12)</td>
<td>2 (12)</td>
<td>4 (24)</td>
<td></td>
</tr>
<tr>
<td>Circumstantial</td>
<td>2 (8)</td>
<td>2 (9)</td>
<td>4 (17)</td>
<td></td>
</tr>
<tr>
<td>Deontic</td>
<td>2 (6)</td>
<td>2 (12)</td>
<td>4 (20)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6 (28)</strong></td>
<td><strong>6 (33)</strong></td>
<td><strong>12 (61)</strong></td>
<td></td>
</tr>
</tbody>
</table>

*Table 5.1 – Number and type of context stories (and sentences rated) in the grammaticality judgment questionnaire*

Within each context-trial, the participants rated several sentences on a 1-5 Likert scale. Each participant rated a total of 61 test sentences. The number of sentences per context varied between 3 (n=5, necessity circumstantial, possibility deontic and possibility circumstantial) and 6 (n=7). In the contexts where only three sentences were rated, there was no (im)perfective counterpart for the embedded verb. For the possibility deontic and circumstantial contexts, one of the two contexts contained an immutably perfective verb, and the other imperfective.

Where the embedded verb allowed it, aspectual morphology on the lexical verb was varied. The subject was never 3SG, to enable us to see presence or absence of agreement morphology on the modal verb, which was also varied. However, the subject φ-features were varied. The final variable was the presence or absence of infinitival *biti* ‘be’ following the non-agreeing (3SG) modal verb.

Before starting, the participants were shown two simple example contexts, each followed by four sentences to be rated (sample task). Each sample task was followed by a textual description of how the sample sentences are to be rated, with example ratings of 1-5 on a Likert scale, and descriptions of what each rating represented. It was made clear that they were not ranking the sentences (all sentences could be given the same rating),

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that the ratings were not intended to correspond to the prescriptive norms, and that the sentences were not being rated for grammaticality independently of context.

5.1.2 Participants

A total of 25 (10 male, 15 female) participants from Bosnia and Herzegovina filled out the questionnaire. Their age ranged from 20 to 65 ($M=38.24$), and their highest education levels varied from vocational high school to postgraduate degrees. Most (n=21) were born in Sarajevo, and almost all (n=23) lived in Sarajevo for at least 10 years. They were recruited through word of mouth, and filled out questionnaires on their own.

5.1.3 Analysis

Where participants skipped rating a sentence, NA was entered. Following this, all the ratings were transformed into z-scores, in order to standardize the participants’ responses (Schütze & Sprouse, 2014). Z-score transformations were done within participants, for all sentences rated, including fillers and the sentences that were not analyzed here. This means that the z-scores were obtained from up to 173 ratings per subject (min=167), rather than the 61 ratings of the test sentences.

Following this, I extracted only the test sentences, grouping them by context type (force/flavor) and by sentence type (modal agreement/embedded verb aspect/infinitival BE). For each group, I calculated the average (across-subject) z-score.

Finally, I ran logistic mixed effects models to test the significance of each of the three variables. The models had an intercept for participants, and fixed effects for modal force, modal flavor, and subject $\phi$-features (233a), with the full models containing a fixed effect (a) for agreement on the modal verb, (b) aspect on the embedded verb, or (c) presence of BITI. The p-values were calculated via likelihood ratio tests using the ANOVA
function in R (lme4, Bates et al. (2014)) (233c), and the test statistic followed $\chi^2$ distribution with df degrees of freedom.

(233)  
\[ \text{a. } Z_{\text{RATING}} \sim \text{PHI + FLAVOR + FORCE + (1 } \mid \text{PART) – null} \]
\[ \text{b. } Z_{\text{RATING}} \sim \text{SVMATCH + PHI + FLAVOR + FORCE + (1 } \mid \text{PART) – full} \]
\[ \text{c. } \text{anova(fullmodel, nullmodel)} \]

5.1.4 Results and discussion

The average $z$-transformed ratings for each sentence type in contexts compatible with deontic modal flavor are shown in Figure 5.1. We see that only the sentences in which the modal verb bears the subject’s $\phi$-features ((a) and (b)) are rated more than 0.25 standard deviations (sd) above the mean – actually about 1.25 sd above the mean, while those with infinitival biti ‘be’ following the modal ((e) and (f)) are more than 0.5 sd below the mean.

Figure 5.1 – Mean $z$-transformed ratings in deontic contexts, by sentence type. (a) Mod.((SUBJ)$\phi$) DA V.IP, (b) Mod.((SUBJ)$\phi$) DA V.PVF, (c) Mod.3SG DA V.IP, (d) Mod.3SG DA V.PVF, (e) Mod.3SG biti DA V.IP, (f) Mod.3SG biti DA V.PVF. Error bars are 95% confidence intervals.
The embedded verb bearing perfective aspect is shown to be preferred for verbs that have both perfective and imperfective forms. The embedded verbs used in the deontic possibility contexts did not have aspectual counterparts (see §5.1.1). In the deontic necessity contexts, participants could choose the embedded verb’s aspectual morphology, and a clear preference for perfective is seen (Figure 5.1, compare (a) and (b)).

Similarly, in circumstantial contexts (Figure 5.2) there is a strong contrast between agreeing and non-agreeing modal verbs. Again, in possibility contexts the participants rated either imperfective only, or perfective only verbs. One of the two necessity circumstantial contexts contained a biaspectral (coded as imperfective) verb, which is likely what caused a larger confidence interval for the imperfective forms. Despite that, the preference for perfective forms in circumstantial necessity contexts is evident – the mean z-transformed ratings are 0.37 ± 0.29 sd above the mean with perfective embedded verbs (N=50) and 1.32 ± 0.06 sd above the mean with imperfective ones (N=25).

**Figure 5.2** – Mean z-transformed ratings in circumstantial contexts, by sentence type. (a) Mod.(SUBJ) DA V.IP, (b) Mod.(SUBJ) DA V.PF, (c) Mod.3SG DA V.IP, (d) Mod.3SG DA V.PF, (e) Mod.3SG biti DA V.IP, (f) Mod.3SG biti DA V.PF. Error bars are 95% confidence intervals.
Contrary to this, in epistemic contexts we see a clear preference for imperfective forms of the embedded verb, following a non-agreeing 3SG modal verb. In epistemic possibility contexts, only sentences with infinitival biti ‘be’ following the modal verb (Figure 5.3, epistemic possibility, (e)) stand out – the mean z-transformed ratings for such sentences are 1.27 (N=50) ± 0.10 sd above the mean, while the next highest rated sentence is -0.33 ± 0.2 sd below the mean. In epistemic necessity contexts, the preferred form is the biti-less, but otherwise identical to (e), (c). However, the variance is somewhat greater, and (e) is not unacceptable. The mean z-transformed ratings for (e) are 0.3 ± 0.23 sd above the mean, while (c) was rated 0.94 ± 0.14 sd above the mean.

Figure 5.3 – Mean z-transformed ratings in epistemic contexts, by sentence type. (a) Mod.(SUBjφ) DA V.IPF, (b) Mod.(SUBjφ) DA V.PFV, (c) Mod.3SG DA V.IPF, (d) Mod.3SG DA V.PFV, (e) Mod.3SG biti DA V.IPF, (f) Mod.3SG biti DA V.PFV. Error bars are 95% confidence intervals.

The logistic mixed effects models showed that agreement morphology on the modal verb is a strong predictor of grammaticality ($\chi^2(1) = 49.238, p=2.27\text{e}-12 ***$), while aspectual morphology on the embedded verb is less strong (this is likely an effect of the design) but still significant ($\chi^2(1) = 5.7338 p=0.01664 *$). Finally, the presence or absence of biti ‘be’
following the modal is highly significant as a predictor ($\chi^2(1) = 144.47$, $p=2.2e-16$ ***) – unsurprising given that its presence is rated as grammatical in possibility contexts and somewhat grammatical in epistemic necessity contexts ((e) in Figure 5.3), but ungrammatical elsewhere ((e) and (f) in Figures 5.1 and 5.2).

Altogether, these results confirm that BCS adults are categorical in differentiating constructions acceptable in root as opposed to epistemic contexts. As the possibility modal verb requires the presence of *biti*, I chose the necessity modal verb in designing the acquisition study. The stimuli are based on pairs that are categorically different for adults – note the contrast between (b) and (c) in Figures 5.1 and 5.2 as opposed to the reverse contrast between the same items in Figure 5.3.

Before moving on to the child L1 acquisition study itself, in the next section I briefly present the stimulus norming study I conducted to assure the pictures used in the picture-choice task are appropriate depictions of epistemic and root contexts. As language-specific morphosyntactic restrictions dictated the use of plural subjects (to reveal lack of agreement on the modal verb in the epistemic contexts), as well as specific embedded verbs to be used, the materials from Cournane & Pérez-Leroux (in prep.) could not be transferred to BCS and all new stimuli needed to be created.

### 5.2 Norming study

As the study conducted in this chapter is a picture-choice task, it was crucial to assure that the pictures used are as unambiguous as possible. The norming study presented in this section was conducted to determine how appropriate the stimulus pictures are as

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2In order to provide the participants with overt cues from aspect, verbs with distinct aspectual forms needed to be used. This is a language-specific requirement, so the stimuli from Cournane & Pérez-Leroux (in prep.) are not restricted in the same way. The details of this will be discussed in §5.3.
depictions of root or epistemic contexts, and to use the results as guidance for improving the pictures where necessary before conducting the study with child participants.

I designed twelve stories, each consisting of an introductory context (example in (234)) and three test sentences (235). The context was intended to suit any of the test sentences, which all had the same subject – a pair of bear cubs, referred to by the childlike term mede rather than the diminutive medvjedić. All the test sentences had the same predicate as well, but one was non-modal (235a), one fit the frame grammatical in epistemic contexts (235b), and the third fit the frame grammatical in root contexts (235c).

(234) Mede vole da se igraju. Ponekad se u igri isprljaju, ali vole i da budu bears love DA SE play. sometimes SE in play get.dirty but love and DA be čisti. Vidi, ev o ih na igralištu! clean. look here3 3PL.GEN on playground ‘The bear cubs like to play. Sometimes, while playing, they get dirty, but they also like to be clean. Look, here they are at the playground.’

   bear.cub-PL SE bathe.IPF-3PL.PRS
   ‘The bear cubs are taking a bath.’

b. Mora-∅ da se mede kupaju.
   must-3SG.PRS DA SE bear.cub-PL bathe.IPF-3PL.PRS
   ‘The bear cubs must be taking a bath.’

   bear.cub-PL must-3PL.PRS DA SE PFV-bathe-3PL.PRS
   ‘The bear cubs must take a bath.’

The goal was for the morphosyntactic frame to be as consistent across test items as possible, so the predicates were chosen based on the following criteria: (i) the aspectual pair of verbs had to exist, and (ii) the imperfective had to be the simple form, while the perfective had to be formed via prefixation from the imperfective. This means that predicates like voziti biciklo ‘ride a bicycle’ were excluded on the grounds of (i), as voziti

\(^{3}\)Evo is a proximal presentative marker.
is imperfective but does not have a perfective ‘pair’ (Barić et al., 1997) and can hence be used embedded in root contexts as well as epistemic ones (see §5.1 above). Predicates like obuti cipele ‘put shoes on’ were excluded on the grounds of (ii), as obuti is perfective in its simple form, and the imperfective form is obuvati.

For each of the twelve stories, I drew four pictures, one to depict the context, and one for each of the test sentences. The set of pictures accompanying the sentences in (234) and (235) is shown in Figure 5.4. The total number of pictures was 48, 12 of which were context pictures, with 36 test pictures (12 non-modal, 12 root-compatible and 12 epistemic-compatible).

![Figure 5.4](image)

**Figure 5.4** – The picture types involved in each story, exemplified by pictures accompanying (234) and (235) Clockwise from top left: context (234), non-modalized (235a), epistemic (235b) and root (235c).

In the norming study, the participants spent about 15 minutes filling out a survey hosted online (Qualtrics), the link to which was distributed via social media. The participants rated sentence acceptability within a particular visual context, by using a 1-5 Likert
scale to rate how well sentences describe pictures they are shown. Participants were presented with the context (the context picture, accompanied by text), after which they were shown a test picture. Each participant only rated one of the three test pictures per story, rating a total of 12 pictures. For each picture they examined, the participants were asked to rate how well each test sentence serves as accompanying text for the picture.

This means that, if a participant saw the context picture from Figure 5.4, and was then shown the epistemic picture (bottom right), they would rate all of the sentences from

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4The scale was not accompanied by verbal descriptors, but the obligatorily attended public school system in the BCS-speaking countries uses grades 1-5, with the following descriptors: 1 - insufficient/fail, 2 - sufficient, 3 - good, 4 - very good, 5 - excellent.
(235), as shown in Figure 5.5. Ideal results would mean the target sentence would receive a rating of 5, and the competitor pictures would receive a rating of 1.

For each of the contexts, it was pseudo-randomly selected which of the three test pictures a participant will see, weighted so that each picture is rated by the same number of participants.\(^5\) The order of contexts was randomized. The order in which the test sentences were presented was pseudorandomized.

The respondents needed to carefully read the context (2-3 sentences), examine the context picture, examine the test picture, and rate three sentences. Assuming that this cannot all be carefully done in under 30 seconds, and given that this needed to be done 12 times, the time taken to just do the task cannot be below 360 seconds. The participants also needed to read and agree to the consent form, fill out answers to three questions (place of birth, place of residence and year of birth), and most importantly read the introductory instructions carefully. Assuming at least 60 seconds is needed for that, I set the cutoff point in terms of time taken to complete the survey to be 7 minutes (420 seconds), and discarded the results of participants who took less than that.

### 5.2.1 Participants

309 people completed the survey, out of which 179 took no less than 7 minutes and no more than an hour to complete the task. Of those, 143 were located in the geographical area of Croatia, Bosnia and Herzegovina, Serbia, and Montenegro (determined through IP-based geolocation). The majority were from Sarajevo (91), with other speakers from most urban centers in Bosnia and Herzegovina (Tuzla, Banja Luka, Zenica, Mostar), Croatia (Zagreb) and Serbia (Novi Sad, Belgrade, Niš) and some from smaller towns.

Among those, three subjects used no rating other than 1, rating 12 or 13 sentences total, all of them with 1. These subjects were excluded as uncooperative (leaving 140 sub-

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\(^5\)Fully random selection could have resulted in an unbalanced distribution of the picture types
jects total). Post-hoc analysis determined that 29 participants rated epistemic constructions as 1 in all contexts, suggesting that they find the sentence frame ungrammatical on principle. 5 participants gave all sentences of a particular type a rating of 5, 4 of them for non-modalized only, 1 for both realis and root contexts. Two of those six were also subjects who rated all epistemic sentences with 1, suggesting that they were not rating sentences based on the context, but rather based on grammaticality. I excluded these participants (32/140), as their use of the Likert scale seemed to not in any way be context-dependent, but rather structure-driven. Of the final 108 participants, 71 were from Sarajevo, and the geographical distribution of the remaining 37 is shown in Figure 5.6.

![Geographical distribution of participants](image)

**Figure 5.6** – Geographical distribution of the participants in the norming study, Sarajevo (71 participants) excluded.

### 5.2.2 Results

Only the non-modalized sentences received consistently high ratings, with 9/12 having a mean rating of 4 or higher with the target pictures, with the remaining 3/12 receiving a mean rating of 3.6 or higher. Additionally, when serving as a competitor for epistemic sentences, non-modalized sentences were rated higher than the targets with all but three pictures.
For root sentences, only 4/12 received a mean rating of 4 or higher with the target picture (the mean rating was between 2.5 and 4.8), but the epistemic competitors were all rated on average under 2.4. Likewise, while only 1/12 epistemic sentences were rated higher than 4 with the target picture, the mean ratings were between 2.33 and 4.29 for targets, but between 1.82 and 3.75 for the root competitors.

To compare targets and competitors in their respective contexts, and attempting to avoid the issues of different participants’ differing uses of the Likert scale, each of the 108 participants’ ratings were standardized by z-transforming. The ratings were then presented as pair-plots, comparing epistemic/root sentences against the epistemic/root pictures. A sample of the results where for each picture the target sentence is rated above average, and the competitor is rated below average, is shown in Figure 5.7 for the picture/sentence pair containing the verb (sa)kriti se ‘hide’.

![Figure 5.7 – Sample picture norming results: Z-transformed ratings for epistemic and root sentences as descriptors of epistemic (left, 37 participants) and root (right, 36 participants) pictures.](image-url)
The scores were used to determine which sets of pictures should be discarded, and which should be adjusted before proceeding to the experimental phase. A total of 5/36 pictures were modified following the norming phase. In two cases, the context picture was edited to remove bias towards deontic interpretation. In another two, the root picture was changed to reinforce the imperative. Finally, one of the epistemic pictures was edited to remove visual evidence, thus reinforcing epistemic interpretation. For two sets of pictures, the responses in the root as opposed to epistemic contexts were not contrastive enough to suggest that editing the pictures in any way would improve the results, so they were discarded.

5.3 Methods

This study uses the picture-choice task from the Modal Flavor study from Cournane (2015a) and Cournane & Pérez-Leroux (in prep.). The experiment is written in MATLAB, using the Psychophysics Toolbox extensions (Brainard, 1997). In this task, the participants are invited to watch a character, ‘Penguin’, read us a picture book. Penguin speaks via pre-recorded audio files, recorded with neutral prosody by an actor with experience in voice acting for children’s TV. The experiment begins as follows: after Penguin introduces himself (Figure 5.8), participants re-affirm that they want to hear Penguin’s stories, and proceed onto the training phase. If both parental and child’s permission to make audio-recordings of the experiment was obtained, the experiments were recorded. The child was explicitly told, in age-appropriate language, that they could withdraw their permission to record at any point during the recording.6

6Children understood and exercised their rights: One child withdrew the permission to record halfway through the task, but completed the task. Two children decided not to complete the task after having started. Two children denied the permission to record.
There are four training items. The first two are simpler than test items, consisting only of choosing a picture that matches what Penguin said (Figure 5.9). This is to habituate the participants to choosing pictures, and to provide an unambiguously correct answer on each side of the screen. Additionally, the training items served to introduce the characters of the stories in the test items. The following two training items matched the test items in structure. During this phase, participants’ wrong answers are corrected.

**Figure 5.8** – Penguin introducing his story book: *Ovdje imam jednu slikovnicu u kojoj ima puno priča. Pokazaču ti neke od njih.* ‘Here I have a picture book with many stories in it. I will show you some of them.’

**Figure 5.9** – First training item: *Vidi! Ovo su male mede.* ‘Look! These are little bear cubs.’
A test item is structured in the following way: the participant first sees one picture which sets up the context, and hears Penguin describe the picture while the picture is on the screen. Following this, Penguin turns the book to himself, flips the page and says the test sentence. During the auditory input, the book is turned away from the participant (as in Figure 5.8). For the item in Figure 5.10, the introductory story is: Mede, zeko i maca vole da se igraju žmire. U hodniku nema puno mjesta za sakrivanje. ‘The bear cubs, bunny and kitty like to play hide-and-seek. There aren’t many places to hide in the hallway.’ As described above, the test sentence takes the form of (236a) or (236b).

Figure 5.10 – A sample trial.
(236)  a. Mora-∅ da se mede kri-ju iza zavjese.
    must-3SG.PRS DA SE bear.cubs hide.IPF-3PL.PRS behind curtain
    ‘The bear cubs must be hiding behind the curtain.’  (epistemic)

    b. Mede mora-ju da se sa-kri-ju iza zavjese.
    bear.cubs must.3PL.PRS DA SE PFV-hide-3PL.PRS behind curtain
    ‘The bear cubs must hide behind the curtain.’  (root)

After saying the sentence, Penguin turns the book to the participant and says Pogledaj! ‘Look!’ The participant is then asked to show which picture Penguin was looking at. For the item in Figure 5.10, the target image for the epistemic (236a) is on the left-hand side, and the target image for the root (236b) is on the right.

If the participant interprets the sentence they hear as epistemic necessity that the bear cubs are hiding behind the curtain, they will choose the picture in which the exact location of the bear cubs is not evident, but given what we know (there aren’t many places to hide, we can’t see the bears, we see a curtain) the bears must be behind the curtain. If, on the other hand, they interpret it as root necessity (teleological here – as they want to not be seen, they must hide behind the curtain) the participant will choose the picture in which the kitty is still turned to face the wall, and the bears are moving towards the curtain. The alternative picture is not readily compatible with the root reading – the kitty is already seeking, so the time to go hide has passed, and the bears are already hidden.

Each participants saw 10 test items and 5 fillers, in random order (the first post-training item was always a filler). The fillers used verbs voljeti ‘love’, mrziti ‘hate’ and htjeti ‘want’, which made them highly similar to root modal test items in terms of linear order and structural complexity, although they required attending only to the depicted emotional state of the protagonist (happy face vs. crying). An example is in Figure 5.11.

As the only thing participants had to attend to were simple emotion words and characters’ facial expressions, I used filler accuracy as an exclusion criterion. Since at chance would be 2.5, I conservatively set the limit to 4/5 as unambiguously above chance,
and excluded participants whose performance on filler items was below that. Within the test items, each participant heard 5 monoclusal modal sentences, and 5 biclausal ones, randomly selected. For each test item, the order of the pictures (i.e., which picture was on which side of the screen) was randomly selected.

After choosing the picture, the child participants were asked *Kako znaš?* ‘How do you know?’ to make the task more interactive and gain insight into what they were attending to in making the choice. For some children, that yielded feedback of the type *ja*
sve znam! ‘I know everything!’ or Naučio me tata. ‘Daddy taught me.’ On following trials, those children were asked to say what Penguin said and/or what they saw in the picture that made them choose it.

5.3.1 Participants

The participants in this study were 60 typically developing monolingual BCS-speaking children and 9 dialect-matched adults from Sarajevo, Bosnia and Herzegovina (12 adults who lived in Sarajevo completed the task, 3 were excluded as they were not dialect-matched, i.e., they moved to Sarajevo as adults). Four of the children were excluded; three ended participation early, one only chose the right-hand side of the screen. The remaining children were divided into four age groups, three-year-olds (n=14, M=42 months, st.d.=3.7 months), four-year-olds (n=15, M=54 months, st.d.=3.4 months), five-year-olds (n=15, M=66 months, st.d.=3.9 months), and six-year-olds (n=12, M=77.5 months, st.d.=3.3 months). The children were recruited through public pre-school institution J.U. Djeca Sarajevo and the study was conducted in the preschool, after parental consent was obtained. The adult controls were recruited by word of mouth. Their age ranged from 23 to 62 (M=34.6 years, st.d.=10.46 years), and their education levels ranged from vocational high school to post-graduate degrees.

5.4 Results

Participants whose filler accuracy rate was at or below 3/5 (arguably at chance) were excluded from the analysis. None of the adults, or 6-year-olds, were eliminated for this reason, and only one 5-year-old was (leaving 14/15). However, younger children performed less well, with four 4-year-olds being excluded (leaving 11/15), as well as half of the 3-year-olds (7/14). The age distribution of the youngest group (n=14, M=42 months,
st.d.=3.7 months) changed only slightly after removing the participants who were arguably not on task (n=7, M=41 months, st.d.=4.5 months).

To repeat, my hypothesis was that children younger than 4;0 years old reanalyze biclausal sentences to incorporate *must* into a monoclausal structure, therefore behaving equally in the two conditions, while older children’s interpretations become gradually more adultlike, to fully adultlike by age 6. To test this, the rate of choosing epistemic-compatible indirect evidence (IE) pictures was measured for each age group, separately for biclausal and monoclausal condition.

Adult controls behaved as expected with biclausal sentences (Table 5.2), choosing the picture providing indirect evidence 4.78/5 times. When hearing monoclausal sentences, on the other hand, they chose the unexpected (based on §5.1 and Chapter 2) indirect evidence picture *M*=1.67/5 times.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>Median</th>
<th>st.d.</th>
<th>SE</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-year-olds</td>
<td>3.29</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>0.49</td>
<td>0.17</td>
<td>7</td>
</tr>
<tr>
<td>4-year-olds</td>
<td>2.64</td>
<td>1</td>
<td>4</td>
<td>3</td>
<td>0.92</td>
<td>0.26</td>
<td>11</td>
</tr>
<tr>
<td>5-year-olds</td>
<td>3.64</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>0.84</td>
<td>0.22</td>
<td>14</td>
</tr>
<tr>
<td>6-year-olds</td>
<td>3.58</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>0.79</td>
<td>0.22</td>
<td>12</td>
</tr>
<tr>
<td>adults</td>
<td>4.78</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>0.44</td>
<td>0.13</td>
<td>9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age group</th>
<th>Mean</th>
<th>Min</th>
<th>Max</th>
<th>Median</th>
<th>st.d.</th>
<th>SE</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-year-olds</td>
<td>2.29</td>
<td>1</td>
<td>4</td>
<td>2</td>
<td>1.11</td>
<td>0.39</td>
<td>7</td>
</tr>
<tr>
<td>4-year-olds</td>
<td>3.09</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>1.14</td>
<td>0.34</td>
<td>11</td>
</tr>
<tr>
<td>5-year-olds</td>
<td>3.00</td>
<td>1</td>
<td>5</td>
<td>3</td>
<td>1.11</td>
<td>0.28</td>
<td>14</td>
</tr>
<tr>
<td>6-year-olds</td>
<td>3.50</td>
<td>2</td>
<td>5</td>
<td>4</td>
<td>0.91</td>
<td>0.25</td>
<td>12</td>
</tr>
<tr>
<td>adults</td>
<td>1.67</td>
<td>0</td>
<td>3</td>
<td>2</td>
<td>1.00</td>
<td>0.31</td>
<td>9</td>
</tr>
</tbody>
</table>

Table 5.2 – Choice of indirect evidence pictures by age group. Mean, Min, Max and Median all between 0 and 5. SE = standard error of the mean with bootstrap resampling, *r*=1000.

When hearing monoclausal sentences, 3-year-olds were most adult-like, choosing indirect evidence (epistemic) pictures in *M*=2.29/5 trials, with older children getting pro-
gressively less adult-like. Least adult-like are 6-year-olds, who choose the non-target epistemic picture in $M=3.5/5$ trials. In this sense, the 6-year-olds do not differentiate between monoclausal and biclausal sentences in their responses, and overwhelmingly choose indirect evidence pictures. This is visually represented in Figure 5.12.

![Figure 5.12](image)

**Figure 5.12** – Mean indirect evidence picture choice by age. Error bars represent standard error of the mean with bootstrap resampling.

Test for equality of proportions between five samples (four child age groups, and adults) was used to test the null hypothesis that the proportion of correct answers is the same in each age group. The test was repeated across all test trials, and for each condition (biclausal and monoclausal). With adults included, we see a significant difference in proportions (Table 5.3). Furthermore, the $\chi^2$ test for trend in proportions shows that, when adults are included as a target group, the null hypothesis that there is no linear trend in the proportion of correct answers by age group is rejected for biclausal trials ($\chi^2(1)=14.78$, $p=0.0001$). No trend is found for monoclausal trials when adults are included ($\chi^2(1)=0.61$, $p=0.43$).
### Table 5.3 – Five-sample test for equality of proportions

<table>
<thead>
<tr>
<th></th>
<th>3y.o.</th>
<th>4y.o.</th>
<th>5y.o.</th>
<th>6y.o.</th>
<th>adults</th>
<th>$\chi^2(4)$</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>all trials</td>
<td>0.60</td>
<td>0.45</td>
<td>0.56</td>
<td>0.51</td>
<td>0.81</td>
<td>29.49</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>biclausal</td>
<td>0.66</td>
<td>0.53</td>
<td>0.73</td>
<td>0.72</td>
<td>0.96</td>
<td>22.84</td>
<td>&lt;0.001***</td>
</tr>
<tr>
<td>monoclausal</td>
<td>0.54</td>
<td>0.38</td>
<td>0.40</td>
<td>0.30</td>
<td>0.66</td>
<td>16.88</td>
<td>0.002*</td>
</tr>
</tbody>
</table>

When adults are not included, the test for equality of proportions between four samples does not find a significant difference in proportions of correct answers in either biclausal ($\chi^2(3)=6.66, p=0.08333$) or monoclausal conditions ($\chi^2(3)=5.52, p=0.14$). This suggests that the children’s accuracy rate does not change between the ages of 3 and 6, although it is significantly different from the adults’ accuracy rate. No linear trend in proportions of correct answers from 3 to 6 years old is found within biclausal trials ($\chi^2(1)=2.3562, p=0.13$), but the null hypothesis that no linear trend in the proportion of correct answers by age group exists is rejected for monoclausal trials ($\chi^2(1)=4.33, p=0.03$).

To summarize, there is a trend for children to respond to hearing biclausal sentences by increasingly choosing indirect evidence pictures, thus becoming more adult-like. When hearing monoclausal sentences, there is no trend for children to become more adultlike – a linear trend exists between youngest and oldest children, but it is towards choosing more indirect evidence pictures, rather than fewer.

Finally, I ran a nested linear model comparison to test the effect of age on the rate at which children choose indirect evidence pictures. Both the null and the full model had a random intercept for participants, and a fixed effect for condition (sentence type). The full model also had a fixed effect for age. The models were run with the 3-year-olds as a baseline. The p-value was calculated via likelihood ratio test of the full model against the model without the effect for age, using the ANOVA function in R (lme4, Bates et al. (2014)), and the test statistic followed $\chi^2$ distribution with 1 degree of freedom. The results show that, among children, age affected rate of choice of indirect evidence pictures ($\chi^2(1)=7.37,$
p = 0.0066**, increasing it by 0.28 ± 0.10 (standard error). The summary of coefficients of the full model is in Table 5.4.

<table>
<thead>
<tr>
<th></th>
<th>( \beta )</th>
<th>SE(( \beta ))</th>
<th>( t )</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>1.99</td>
<td>0.50</td>
<td>3.95</td>
</tr>
<tr>
<td>Age</td>
<td>0.28</td>
<td>0.10</td>
<td>2.77</td>
</tr>
<tr>
<td>SENTENCERtrial</td>
<td>-0.27</td>
<td>0.20</td>
<td>-1.39</td>
</tr>
</tbody>
</table>

Table 5.4 – Coefficients of the linear mixed model

A visual representation of individual rates of indirect evidence (IE) picture choice is in Figure 5.13 on the next page. Each subplot compares a child age group to adults: 3-year-olds (top left), 4-year-olds (top right), 5-year-olds (bottom left) and 6-year-olds (bottom right), with each dot representing an individual participant (jittered). Along the x-axis is the number of times IE pictures were chosen when hearing biclausal sentences, while y-axis represents the number of times IE pictures were chosen when hearing monoclausal sentences. The adults are not all in the expected bottom left corner (choosing IE pictures 5/5 times when hearing biclausal, and 0/5 times when hearing monoclausal sentences), but they are all located in the bottom left section of the plot (circled on all subplots). The children move from being slightly off-center in the adult-like direction on the x-axis at the age of three (top left subplot) to preferring IE pictures at six (bottom right subplot).

I hypothesized that younger children who have not yet acquired biclausal epistemic uses of modal verbs reanalyze such sentences as monoclausal ones. Children’s feedback during the experiment suggests that this may be true even for 4-year-olds – 4/11 recast epistemic sentences as root. And while 3-year-olds tended to be shy about giving feedback, with only 2/7 elaborating on their picture choices when prompted, one of those two also recast epistemic sentences as root, as shown in (237).
**Figure 5.13** – Participants by number of indirect evidence picture choices when hearing biclausal (x-axis, 0-5) and monoclausal sentences (y-axis, 0-5).

(237)  
   says  penguin  must.3SG.PRS  DA  bear.cubs  make.IPF.3SG.PRS  snowman.
   Koja  je  to  slika?
   which  is  that  picture
   ‘Penguin says: ‘the bear cubs must be making a snowman.’
   Which  picture  is  that?’

S45: Pingvin  je  reko  da  moraju  praviti  snješka.
   penguin  is  said  DA  must.3PL.PRS  make.INF  snowman
   ‘Penguin said they must make a snowman.’

(3;06)
This is less common among older children – none of the 13 5-year-olds who elaborated on their choices, and 2/9 6-year-olds recast epistemic sentences as root. Older children, however, sometimes recast biclausal sentences as non-modal. Among the 6-year-olds, 4 recast biclausal sentences as non-modal, including both who recast them as root as well. An example of a 6-year-old recasting Penguin’s biclausal utterance as non-modal is in (238). Two of the 5-year olds, and one of the 4-year-olds also recast biclausal sentences as non-modal. The 4-year-old recast monoclausal root sentences as non-modal as well.

(238) Peng: Mora da se mede kupa-ju. must.3SG DA SE bear.cubs bathe.IPF-3PL.PRS ‘The bear cubs must be taking a bath.’

Exp: Koju je sliku vidio Pingvin? (...) Kako zna-š? which is picture saw penguin (...) how know-2SG.PRS ‘Which picture did Penguin see? ... How do you know?’

S15: Zato što je reko da se mede kupaju. because is said DA SE bear.cubs bathe.IPF.3PL.PRS ‘Because he said that the bear cubs are taking a bath.’ (6;03)

Multiple children, in various contexts, point to the source of necessity when explaining their choice of root pictures, suggesting that they do understand the task. For example, when asked what they see in the picture that made them choose it as the right picture after Penguin said Mede moraju da se okupaju (The bear cubs must take a bath), S22 (3;09) said Vidim kako su se isprljali ‘I see how/that they got dirty’. When Penguin said Mede moraju da samelju orahe (The bear cubs must grind walnuts), S29 (4;11) chose the root picture and responded to the same question by saying Da im je mama donijela orahe. Moraju se orasi otvorti. (That Mama brought them walnuts. The walnuts must be opened.)

All of the 6-year-olds pointed to indirect evidence as explanations for choosing IE pictures, for both biclausal (239) and monoclausal sentences, even when they accurately repeated monoclausal sentences, as in (240). Some described the pictures in a way com-
patible with having direct evidence, as in (241), where the child says they see the bears
taking a bath even though they do not actually see the bears. In all the conversations from
(239)–(241), the child’s first utterance is a response to Kako znaš? ‘How do you know?’

(239) S56: Tako što ide voda i unutra su. I vidim odjeću.
thus that goes water and inside be.3PL. and see-1SG clothes
‘Because the water is running and they’re inside. And I see clothes.’ (6;07)

(240) S56: Tako što je torta u pećnici.
thus that is cake in oven
‘Because the cake is in the oven.’

Exp:A šta je rekao Pingvin?
and what is said penguin
‘And what did Penguin say?’

S56: Reko je mede mora-ju da naprav-e tortu.
said is bear.cubs must-3PL DA make-3PL.PRS cake
‘He said the bear cubs must make a cake.’ (6;07)

(241) S19: Jer je pingvin rekao mede se moraju okupat.
because is penguin said bear.cubs SE must.3PL.PRS bathe.INF
‘Because Penguin said the bears must take a bath’

Exp:I šta ti tu vidi-š?
and what you there see-2SG.PRS
‘And what do you see there?’

S19: Da se mede kupa-ju.
DA SE bear.cubs bathe.IPF-3PL.PRS
‘That the bear cubs are taking a bath’ (6;07)

To summarize, older children refer to indirect evidence, sometimes claim they see things
not depicted in indirect evidence pictures, by inferring from indirect evidence of an event
to the event itself. They do this when hearing either biclausal or monoclausal sentences.
They rarely recast biclausal sentences as monoclausal, but commonly recast both biclausal
and monoclausal sentences as non-modal. They choose IE pictures when hearing both biclausal and monoclausal sentences.

Younger children sometimes recast biclausal sentences as monoclausal, as hypothesized. They rarely recast either biclausal or monoclausal sentences as non-modal (never for 3-year olds, 2/11 for 4-year-olds). They choose fewer IE pictures than older children, and are more adultlike than older children when hearing monoclausal sentences. A summary of the qualitative results discussed here, split by condition, is shown in Table 5.5.

<table>
<thead>
<tr>
<th>Age</th>
<th>Feedback</th>
<th>When hearing biclausal sentences</th>
<th>Point to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Recast</td>
<td>IE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monoclausal</td>
<td>Non-modal</td>
</tr>
<tr>
<td>3 y.o.</td>
<td>2/7</td>
<td>1/2</td>
<td>0/2</td>
</tr>
<tr>
<td>4 y.o.</td>
<td>11/11</td>
<td>4/11</td>
<td>1/11</td>
</tr>
<tr>
<td>5 y.o.</td>
<td>13/14</td>
<td>0/13</td>
<td>2/13</td>
</tr>
<tr>
<td>6 y.o.</td>
<td>9/12</td>
<td>2/9</td>
<td>4/9</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Age</th>
<th>Feedback</th>
<th>When hearing monoclausal sentences</th>
<th>Point to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Repeat/Recast</td>
<td>IE</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Monoclausal</td>
<td>Non-modal</td>
</tr>
<tr>
<td>3 y.o.</td>
<td>2/7</td>
<td>0/2</td>
<td>0/2</td>
</tr>
<tr>
<td>4 y.o.</td>
<td>11/11</td>
<td>4/11</td>
<td>1/11</td>
</tr>
<tr>
<td>5 y.o.</td>
<td>13/14</td>
<td>3/13</td>
<td>1/13</td>
</tr>
<tr>
<td>6 y.o.</td>
<td>9/12</td>
<td>5/9</td>
<td>2/9</td>
</tr>
</tbody>
</table>

Table 5.5 – A summary of qualitative data by age group

5.5 Discussion and Conclusion

These results are unexpected on the frequency hypothesis (Shatz et al., 1983; Papafragou, 1998; Cournane, 2015b; van Dooren et al., 2017) which would predict a preference for root interpretations in both monoclausal and biclausal condition, seeing as morati is overwhelmingly root in BCS (see Chapter 2). None of the age groups show a preference for root interpretations, despite the fact that the children understand deontic and teleological
root interpretations, correctly identifying the modal source. This lack of preference for
root is unexpected for 3-year-olds even when we assume that the morphosyntactic cues
drive modal flavor interpretation.

Additionally, if we assume that morphosyntactic cues alone drive interpretation,
adults ought to have chosen IE pictures in 5/5 biclusal trials and 0/5 monoclausal ones.
In biclusal trials, adults behaved as expected, but in monoclausal trials they allowed for
some IE pictures. These results are highly similar to those of Cournane (2015a); Cournane
& Pérez-Leroux (in prep.), shown in Figure 5.14, where we also see that older children
move towards choosing IE pictures for the majority of both epistemic-preferred modal
aspect sentences and the root-preferred bare modal sentences.

![Figure 5.14](image)

**Figure 5.14** – Indirect evidence picture choice by age, from Cournane & Pérez-
Leroux (in prep.). Each subplot represents an age group, each dot an individ-
ual, and their choice of indirect evidence pictures when hearing modal aspect
sentences (x-axis, 0-8) and bare modal sentences (y-axis, 0-8).

Cournane (2015a) hypothesised that the adult behavior in English could be cap-
tured if we consider habitual interpretations of bare modal sentences such as *Scott must
wear his boots* (often, because his muddy footprints suggest he’s wearing them now). Addition-
ally, the high rates of epistemic uses of *must* (van Dooren et al., 2017) may lead to children
overgeneralizing to the more frequent (epistemic) interpretation. The English-speaking-
children increasingly choosing epistemic-compatible IE pictures may be influenced by one or both of these factors.

If either frequency or morphosyntax were solely conditioning children’s modal flavor interpretation, we expect to see a divergence in the results between BCS-learning children and English-learning children. In BCS, *morati* is overwhelmingly root, while in English it is epistemic. In BCS, the morphosyntactic frames of root and epistemic interpretations are rigid, while in English they are coercable.

Unlike each of these accounts, I propose a pragmatic account, based on the ‘invited inferences’ (Traugott & Dasher, 2001) of deontic uses of modal verbs. Such uses, according to Traugott & Dasher, have inferences to ‘wide scope generalized deontic necessity’, which then historically leads to the emergence of epistemic uses. This inference, that the event which is “necessarily obliged to happen in the future is also obliged to happen in the present” (Traugott & Dasher, 2001: 130), is available to adults speaking both English and BCS. This invited inference (II) combines with the inference from the indirect evidence picture (IE). To cite Von Fintel & Gillies (2010: 361, fn.18): “indirect evidence for a bare prejacent ϕ is still entailing evidence for ϕ in the sense that if must ϕ is true on the basis of such evidence then it will eventually always turn out that ϕ.”

Thus, from the root ‘X must ϕ’, an inference to ‘X is ϕ-ing’ is available, even if the modality in ‘X must ϕ’ is unambiguously interpreted as only root. An obligation normatively implies that the obligatory action is realized. Within the context of the experiment done here, and the study from Cournane (2015a) and Cournane & Pérez-Leroux (in prep.), this means that participants can match root-biased sentences to epistemic pictures, as the epistemic pictures present indirect (entailing) evidence of the normative behavior. To illustrate, each of these inferences, and their combination, is shown in (242):
These inferences are available cross-linguistically, and capture adult behavior. Sentences containing epistemic modal verbs or auxiliaries are interpreted as epistemic and can only be matched to depictions of indirect evidence. On the other hand, sentences interpreted as containing root modal verbs can be matched to either depictions of the existence of a necessity unmet as of yet (as root modals are future-oriented, Condoravdi (2002)) or depictions of indirect evidence of the existing necessity currently being met.

Furthermore, this account captures older children’s choosing IE pictures to depict monoclausal sentences more than adults do. Kalish (1998) shows that pre-school aged children find known social norms to be much less violable than what adults allow. Thus, if children know the meaning of root morati ‘must’, their inference to actual performance of obligatory action is stronger than that of adults.

The remaining questions include why the youngest children do not generalize to IE pictures – adherence to known social norms is strongest with youngest children (Kalish, 1998). However, given that half of the 3-year-olds were excluded due to not being on task, it is possible that the task was too complex. The task required the children to remember Penguin’s utterance while examining the pictures, and two of the 4-year olds explicitly noted the complexity of the task or said they cannot remember what Penguin said. In future research, the task could be simplified by allowing children to see the pictures while hearing the sentences.
The children were not all asked at every trial to repeat what Penguin said, thus the rates of recasting or repeating Penguin’s words cannot be adequately assessed. In future research, a variation of the task to consider would be having the children listen to the sentences via headphones, with the experimenter not hearing. This would make asking questions about what Penguin said more natural, and would yield more consistent feedback.

In conclusion, in this chapter I have shown that modal verb interpretation, while heavily conditioned by morphosyntax (§5.1), is subject to pragmatics as well. Inferences from obligation to epistemic necessity (Traugott & Dasher, 2001) combined with inferences from epistemic necessity to non-modal statements (Von Fintel & Gillies, 2010) enable adults to choose indirect evidence pictures as depictions of unambiguously root modal statements. Pre-school aged children, who assume over-adherence to social norms compared to adults (Kalish 1998, i.a.), over-apply these inferences.
In this dissertation, I have proposed an analysis for the syntax of epistemic and root modal flavors of modal verbs in Bosnian/Croatian/Serbian (BCS). I have argued that root flavors are derived from structures in which the modal verb embeds subjunctive (or infinitival) MoodP, which in turn embeds AspP – the aspectually marked VP, consisting of the embedded verb and its arguments (243). Epistemic interpretations, on the other hand, are derived from biclausal structures in which a CP (phase) barrier intervenes between the modal verb and the event it embeds (244).

(243) \[ [TP \text{ Subj} \left[ T \left[ \text{AspP} \ ... \left[ \text{ModP} \text{ modal} \left[ \text{MoodP} \text{ SBJV} \left[ \text{vP} \ t_i \text{ verb} \right] \right] \right] \right] \right] ] \]

(244) \[ [TP_1 \ ... \left[ \text{ModP} \text{ modal} \left[ \text{MoodP} \ ... \left[ \text{AspP} \ ... \left[ \text{vP} \ ... \left[ \text{CP} \ C \left[ TP_2 \text{ Subj} \left[ T \left[ \text{AspP} \ ... \left[ \text{vP} \ t_i \text{ verb} \right] \right] \right] \right] \right] \right] \right] \right] ] \]
This proposal makes for a unified syntax of modal verbs, as modal verbs embed subjunctive or infinitive MoodP regardless of flavor. When the embedded MoodP is subjunctive, and subject agreement with multiple verbal elements in a single CP is possible, a CP barrier between modal verbs and the verbs they embed is required for epistemic interpretations. I have shown that CP-embedding biclausal structures yield epistemic interpretations even in languages where they are not required in order for modal verbs to be interpreted as epistemic.

In languages where modal verbs embed infinitival complements, TP embedding under modal verbs is sufficient for epistemic interpretations, with the exception of Hebrew verb yahol ‘can’ which requires CP embedding on epistemic interpretations despite embedding infinitival complements when interpreted as root. The question of the exact mechanisms that make biclausal constructions a prerequisite for epistemic interpretations of modal verbs is left for future research. Based on the patterns observed for Slavic and Romance languages in Chapter 3, the key issues pertain to the availability of multiple agreement. Thus, based on Baker (2008), exploring data from Bantu languages might be a good direction to go in for further explorations of modal verb syntax.

Additionally, questions of the patterns of grammaticalization of modal verbs are left for future research. One such question is whether the split between CP-embedding and TP-embedding epistemic modal verbs as proposed in Chapter 3 corresponds to distinct paths of grammaticalization, with Greek future tha grammaticalizing to C, while the English modal auxiliaries grammaticalized to T.

Finally, the issues of learnability of modal verbs with variable flavors remain. However, fleshing out the syntax in detail, by applying an array of syntactic diagnostics, enables us to make formal predictions for quantitative work. I provided evidence that the syntactic differences between BCS and English modal verbs/auxiliaries explain the differences in their rates of production in child language acquisition in ways that nei-
ther input frequency alone nor cognitive development can. However, in Chapter 5 I have shown that, while the syntax in BCS is rigid, and affects L1A, it is not the sole contributor. Modal flavor interpretation is additionally dependent on pragmatic inferences, which also contribute to language change and grammaticalization of modal verbs.

Much work still needs to be done when it comes to the syntax of modal verbs – I have only dealt with a small number of verbs in a small number of languages – but this thesis presents a systematic examination of one language and lays the groundwork for exploring the syntax of modal verbs in other languages.
Appendix: Materials for the L1A experiment

Listed below are the test trial materials for the child language experiment discussed in Chapter 5. For each trial, the context screen is shown first. Below that, the test screen is shown with the indirect evidence picture, which is the target for the biclausal (a) sentence, on the left, and the picture which is the target for the monoclausal (b) sentences on the right. In the experiment, this was randomized, see §5.3 in Chapter 5. The BCS text read as context by Penguin is in the caption of each figure. The English translation of the context is given below the figure, followed by the pair of sentences matching the context (each participant only heard one of the two sentences in each context).
Figure A1 – Trial1. Context: Mami medvjeti je rođendan. Medvjedi su joj kupili poklon i pozvali su njene prijatelje na zabavu. Pripreme su u toku.

Context translation: ‘It’s Mama bear’s birthday. The bear cubs bought her a present and invited her friends to a party. They are getting things ready.’

   must-3SG.PRS DA bear.cubs bake.IPF-3PL.PRS cake  
   ‘The bear cubs must be baking the cake.’  
   (epistemic)

b. Mede mora-ju da is-pek-u tortu.  
   bear.cubs must.3PL.PRS DA PFV-bake-3PL.PRS cake  
   ‘The bear cubs must bake the cake.’  
   (root)
Context translation: ‘The bear cubs love to play. They sometimes get dirty while playing, but they also love being clean. See! Here they are at the playground.’

(A2) a. Mora-∅ da se mede kupa-ju.
must-3SG.PRS DA SE bear.cubs bathe.IPF-3PL.PRS
‘The bear cubs must be taking a bath.’

(b. Mede mora-ju da se o-kupa-ju.
bear.cubs must.3PL.PRS DA SE PFV-bathe-3PL.PRS
‘The bear cubs must take a bath.’

(epistemic) (root)
Figure A3 – Trial3. Context: Mede vole da crtaju. U vrtiću nekad teta svima zadat nešto, a nekad svako može crati šta god želi.

Context translation: ‘The bear cubs love drawing. The daycare teacher sometimes asks everyone to draw the same thing, and sometimes they can all draw what they want.’

(A3)  

must-3SG.PRS DA bear.cubs draw.3PL.PRS flowers  
‘The bear cubs must be drawing flowers.’  
(epistemic)

b. Mede mora-ju da na-crta-ju cvijeće.  
bear.cubs must.3PL.PRS DA PFV-draw-3PL.PRS flowers  
‘The bear cubs must draw flowers.’  
(root)
Figure A4 – Trial4. Context: Medvjedići iza kuće, u dvorištu, imaju bazen, i vole da se kupaju u njemu tokom ljeta. Zimi tata medvijed isprazni bazen. Danas je prvi dan ljeta.

Context translation: ‘The bears have a pool in the back yard, and like to swim in it in the summer. Papa bear empties the pool in the winter. Today is the first summer day.’

must-3SG.PRS DA bear.cubs fill.IPF-3PL.PRS pool  
‘The bear cubs must be filling the pool.’  
(epistemic)

b. Mede mora-ju da na-pun-e bazen.  
 bear.cubs must.3PL.PRS DA PFV-fill-3PL.PRS pool  
‘The bear cubs must fill the pool.’  
(root)
Figure A5 – Trial 5. Context: Mede jako vole baklavu. Mama medvjedica je otišla na pijacu da kupe orah u ljusci. Ako mede budu dobri i pomognu joj, mama M. će da im napravi baklavu.

Context translation: ‘The bear cubs really like baklava. Mama bear went to the market to buy walnuts. If the cubs are good and help her, Mama bear will make them baklava.’

(A5) a. Mora-∅ da mede melj-u orah-e.  
must-3SG.PRS DA bear.cubs grind.IPFP-3PL.PRS walnuts  
‘The bear cubs must be grinding the walnuts.’  
(epistemic)

b. Mede mora-ju da sa-melj-u orah-e.  
bear.cubs must.3PL.PRS DA PFV-grind-3PL.PRS walnuts  
‘The bear cubs must grind the walnuts.’  
(root)
**Figure A6** – Trial6. Context: *Mede, zeko i maca vole da se igraju žmire. U hodniku nema puno mjesta za sakrivanje.*

Context translation: ‘The bear cubs, bunny and kitty like to play hide-and-seek. There aren’t many places to hide in the hallway.’

(A6)  

   must-3SG.PRS DA SE bear.cubs hide.IPF-3PL.PRS behind curtain  
   ‘The bear cubs must be hiding behind the curtain.’  
   (epistemic)

b. Mede mora-ju da se sa-kri-ju iza zavjese.  
   bear.cubs must.3PL.PRS DA SE PFV-hide-3PL.PRS behind curtain  
   ‘The bear cubs must hide behind the curtain.’  
   (root)
Context translation: ‘The bear cubs and the bunny rabbits have a Snowman-making competition each year. Last year the bunny rabbits won. Today we had the first snow. It’s competition time.’

(A7) a. Mora-∅ da mede prav-e snješka. must-3SG.PRS DA bear.cubs make.IPF-3PL.PRS snowman ‘The bear cubs must be making a snowman.’ (epistemic)

b. Mede mora-ju da na-prav-e snješka. bear.cubs must.3PL.PRS DA PFV-make-3PL.PRS snowman ‘The bear cubs must make a snowman.’ (root)
Figure A8 – Trial8. Context: U kući porodice medvjeda, pribor za brisanje podova stoji pored ulaznih vrata. Kad metla i krpa nisu pored vrata, neko čisti pod. Mama medvjedica voli da se pod uvijek blista.

Context translation: ‘In the bear family’s home, the floor-cleaning implements are kept by the door. When the broomstick and the mop aren’t by the door, someone is cleaning the floor. Mama bear likes the floor to always be sparkling.’

(A8)  

must-3SG.PRS DA bear.cubs wipe.IPF-3PL.PRS floor  
‘The bear cubs must be mopping the floor.’ (epistemic)

b. Mede mora-ju da o-briš-u pod.  
bear.cubs must.3PL.PRS DA PFV-wipe-3PL.PRS floor  
‘The bear cubs must mop the floor.’ (root)

Context translation: ‘The bears have a pear tree in the yard. All the bears like to eat pears. Mama bear doesn’t like for pears to be wasted. She is happiest when all the pears are picked as soon as they are ripe.’

must-3SG.PRS DA bear.cubs pick.IPF-3PL.PRS pears
‘The bear cubs must be picking the pears.’ (epistemic)

b. Mede mora-ju da u-ber-u kruške.
bear.cubs must.3PL.PRS DA PFV-pick-3PL.PRS pears
‘The bear cubs must pick the pears.’ (root)
Figure A10 – Trial10. Context: Tata medvjed voli da kuha, i napravio je odličnu večeru. Medvjediči uvijek pomažu mami da počisti poslije večere.

Context translation: ‘Papa bear likes to cook, and he made an excellent dinner. The bear cubs always help Mama clean up after dinner’

(A10) a. Mora-∅ da mede per-u suđe.  
must-3SG.PRS DA bear.cubs wash.IPF-3PL.PRS dishes  
‘The bear cubs must be doing the dishes.’  

(b. Mede mora-ju da o-per-u suđe.  
bear.cubs must.3PL.PRS DA PFV-wash-3PL.PRS dishes  
‘The bear cubs must do the dishes.’  

(epistemic)  
(root)


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