

Modal flavour/modal force interactions in German: *soll, sollte, muss and müsste*

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Abstract

This paper investigates interactions between modal flavour and modal force, concentrating on the German necessity modals *muss* (\approx ‘must’) and *soll* (\approx ‘be supposed to’), and their counterfactual (Konjunktiv II)-inflected versions *müsste* and *sollte*. We argue for the following proposals. First, these modals obey the morphological force-correlation of von Fintel and Iatridou (2008), since weak necessity interpretations turn on the presence of Konjunktiv II. Second, *muss* and *soll* have disjoint modal flavours, in both the root and epistemic domains. Root *muss* is deontic or teleological, while root *soll* is bouletic; epistemic *muss* is inferential, while epistemic *soll* is reportative. Third, the addition of Konjunktiv II has unanticipated effects on modal flavour. When *soll* becomes *sollte*, it changes its modal flavour to that of *muss*. Thus, root *sollte* is deontic or teleological (not bouletic), and epistemic *sollte* is inferential (not reportative). The paper also includes a comparison of the German modals with English *have to*, *should* and *be supposed to*.

Keywords

modality, weak necessity, German, root, epistemic

1 Introduction

The distinction between strong and weak necessity modality is illustrated in (1). According to this sentence, everybody is under a weak obligation to wash their hands, but employees are more strongly obliged to do so.

(1) Everybody *ought to* wash their hands; employees *must*. (von Fintel and Iatridou 2008)

In English, the strong vs. weak necessity distinction is lexicalized (*must/have to* vs. *should/ought to*), but in many languages, it is encoded morphologically. As shown by von Fintel and Iatridou (2008), in languages such as Dutch, French or Greek, the addition of counterfactual morphology to a strong necessity modal derives a weak necessity interpretation. This is illustrated for French in (2), in which the strong necessity modal *devoir* contains

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conditional morphology and is interpreted as a weak necessity modal.²

- (2) Tout le monde **devrait** se laver les mains mais les serveurs sont obligés.
 everybody **must.COND REFL** wash the hands but the waiters are obliged
 ‘Everybody **ought to** wash their hands but the waiters have to.’
 (von Fintel and Iatridou 2008)

The available literature on weak necessity concentrates mainly on data involving root modal flavours (such as deontic or teleological), while observing that epistemic modals also show a strong/weak necessity contrast. So far, interactions between the strength of a modal and its flavour have not been the focus of discussion.

In this paper we investigate strong and weak necessity modality in German, concentrating on the modals in (3): the necessity modals *muss* (\approx ‘must’) and *soll* (\approx ‘be supposed to’), and their counterfactual (Konjunktiv II-inflected) versions *müsste* and *sollte*.³ We investigate both root and epistemic interpretations of these modals, in their matrix-clause uses (see Schenner 2008, among others, on embedded uses).

(3)

necessity modal	necessity modal + K.II
<i>muss</i>	<i>müsste</i>
<i>soll</i>	<i>sollte</i>

We argue that this set of German modals fits *partially* with the accounts of weak necessity provided by von Fintel and Iatridou (2008) and Rubinstein (2012). In a general way, the mini-system in (3) supports the morphological correlation postulated by von Fintel and Iatridou (2008), in that a weak necessity interpretation only arises with the addition of Konjunktiv II morphology. However, there are two deviations from the expected pattern.

The first one is particularly interesting: When *soll* becomes weak necessity *sollte*, it changes its modal flavour to that of *muss*, giving up the original modal flavour of *soll*. We present empirical tests to show that *muss* and *soll* are restricted to a disjoint set of modal flavours and that weak necessity *sollte* takes on the modal flavours of *muss*, abandoning those of *soll*. This is true in both the root and epistemic domains. In the root domain, we argue that *muss* is purely deontic or teleological, while *soll* is purely what we call *externally bouletic* (roughly, bouletic with the restriction that the holder of the desire is not the subject of the clause). *Sollte* patterns with *muss* rather than with *soll* in being deontic or teleological, and in lacking the eternally bouletic interpretation. In the epistemic domain, we support existing proposals that *muss* is inferential and *soll* is reportative, and we show that weak necessity *sollte* gives up the reportative flavour and takes on the inferential one of *muss*.

The second quirk of the German strong/weak necessity system is that while epistemic *müsste* is a well-behaved weak necessity version of its strong counterpart *muss*, root *müsste* shows variation as to its weak necessity behaviour. We analyze this in terms of interference by the *free factive subjunctive*, as discussed and analyzed by Csipak (2015).

Our analysis of German supports a growing body of evidence that individual modals can lexicalize quite specific modal flavour information (see Kratzer 1991, Rullmann et al.

² Throughout the paper, our morpheme glosses abstract away from inflectional details such as case and gender information.

³ We cite *muss* and *soll* in their third person indicative present forms, rather than their standard citation forms, the infinitives *müssen* and *sollen*. This enables a unified form of reference which extends to the Konjunktiv II versions *müsste* and *sollte* (as these lack separate infinitive counterparts).

2008, von Fintel and Gillies 2010, among many others). Our proposal also entails that there is a clear distinction between sub-types of root modality, specifically between deontic, teleological and bouletic modal flavours. This challenges Portner’s (2009:185) claim that these flavours are ‘not mutually exclusive’ and that they should be grouped all together as ‘priority modals’. We argue that German makes clear distinctions within the priority modal domain, and we provide preliminary evidence that English shows some similar sharp boundaries.

An intriguing question that our proposal raises is why there is a shift from the bouletic modal flavour of *soll* to the deontic/teleological modal flavour of *sollte*, and why the epistemic flavour of *soll* shows a parallel shift from reportative to inferential. We hypothesize that the reason for this shift is that there is in principle no weak necessity option available for bouletic or reportative modals. For bouletics, this idea receives striking support from an unrelated language Paciran Javanese, as discussed by Hohaus and Vander Klok (2017a, b).

The paper is structured as follows. In section 2 we provide general background on modal force and modal flavour, and discuss some methodological considerations. Section 3 is devoted to the modal flavours of *muss* and *soll*. In sections 4 and 5 we test and analyze *sollte*, and section 6 does the same for *müsste*. A brief comparison with English is given in section 7, and the results are summed up in section 8.

2 Background on the classification of modals

We introduce relevant modal flavour distinctions in section 2.1. Modal force distinctions are discussed in section 2.2. A classification of German modals by Bech (1949, 1951) and later literature is introduced in section 2.3. Section 2.4 addresses the divide between bouletic and deontic modality.

2.1 Modal flavour

A well-known modal flavour distinction is made in many languages between the root and epistemic uses of a modal.⁴ Some sub-varieties of root use that are particularly relevant here are shown in (4).⁵ Examples are given in (5).

(4)	<i>deontic</i> : related to how the world ought to be	rules and obligations (and permission, not relevant here)
	<i>teleological</i> : related to purposes or goals	goals
	<i>bouletic</i> : related to desires or wishes	preferences

⁴ See Hacquard (2006, 2010), among others, for arguments that this distinction is syntactically based.

⁵ Portner (2009:135ff) argues against a two-way epistemic/root split, and in favour of a three-way division between epistemic, priority, and dynamic modality (where dynamic modality includes, for example, ability readings). We are not dealing with dynamic modals here so we set this aside. (Note also that Portner’s priority and dynamic modals all share a circumstantial modal base.)

- (5) a. You **have to** return your library-books soon. DEONTIC
- b. A: I want to get to Harlem in an hour.
B: You **have to** take the A-train. TELEOLOGICAL
- c. A: What is the purpose of this crazy arrangement you made here?
B: It **is supposed to** attract birds. BOULETIC
≈ I want the arrangement to attract birds.

Epistemic (roughly, knowledge- or evidence-related) uses are illustrated in (6). We follow von Fintel and Gillies (2010) and Matthewson (2015a) in characterizing the epistemic reading of *must* in (6a) as requiring indirect evidence for the prejacent.⁶ We call this reading *inferential*. The reading in (6b) is reportative.

- (6) a. [I observe John driving an expensive new car.]⁷
John **must** have come into some money. INFERENTIAL
- b. [I listened to the weather report and am telling my friend what I heard.]
It **is supposed to** rain. REPORTATIVE
≈ Someone (reliable) said that it will rain.

In the approach developed by Kratzer (1977, 1981, 1991), it is not infrequent that a given modal is compatible with several different modal flavours. For example, Kratzer (1991:650) classifies German *muss* as having no restrictions on its modal flavour. Its particular modal flavour is then narrowed down by the context of utterance (through conversational background functions). For an example of modal flavour ambiguity with English *have to*, cf. (5a) vs. (5b).

Kratzer (1981, 1991, 2012) also provides discussion of German and English modals which do place restrictions on modal flavour. For example, English *may* allows epistemic and deontic interpretations, but *might* is epistemic and cannot be deontic. English affirmative *can* cannot be interpreted epistemically (see Portner 2009:55,185 for discussion). And German *darf* and *kann* contrast in subtle ways in their allowed modal flavours (Kratzer (1981):59ff).

In other languages we find this even more clearly instantiated. Lexical distinctions between modal flavours are pervasive in languages such as St'át'imcets (Lillooet Salish; Matthewson, Davis and Rullmann (2007), Rullmann, Matthewson and Davis (2008), Davis, Matthewson and Rullmann (2009)), Javanese (Austronesian; Vander Klok (2012)), Blackfoot (Algonquian; Reis Silva (2009)), Kwak'wala (Wakashan; Menzies (2010)), Nez Perce (Penutian; Deal (2011)), Nsyilxcen (Okanagan Salish; Menzies (2012)) and Gitksan (Tsimshianic; Peterson (2010), Matthewson (2013)).

2.2 Modal force

The basic modal force distinction is between necessity (e.g. *must*, *have to*) and possibility (e.g. *may*, *can*).

An additional distinction relevant here is that between strong and weak necessity. In English, where the distinction is lexicalized, *must* and *have to* are strong necessity modals, while *should* and *ought to* are weak necessity modals. Horn (1972) described deontic strong

⁶ Following von Fintel (1997) and von Fintel and Iatridou (2008), we refer to the proposition in the scope of the modal as the *prejacent*.

⁷ Discourse contexts for example sentences are given in square brackets.

necessity as *strong obligation* and deontic weak necessity as *weak obligation* or *suggestion*. The distinction allows contrasts like the ones in (7) from von Fintel and Iatridou (2008).

- (7) a. Everybody **ought to** wash their hands; employees **must**.
b. You **ought to** do the dishes but you don't **have to**.

In their teleological use, strong necessity modals give the sense of presenting the only available option for achieving the goal, as in (8a). As shown by Sloman (1970) and further worked out in von Fintel and Iatridou (2008), weak necessity modals seem to present the best (but not only) available option for achieving the goal. The sense in which they are 'best' is in regard to some additional consideration, as shown in (8b).

- (8) [I plan to go to Amherst.]
a. You **have to** take Route 2. (All other roads to Amherst are closed.)
b. You **ought to** take Route 2. (It's the best option given an additional criterion, like seeing nice scenery on the way.)

It is argued by von Fintel and Iatridou (2008) that in a number of languages including Dutch, French, and Greek, the addition of counterfactual morphology to a strong necessity modal derives a weak necessity modal, as in the French example (2) above. This schema is highlighted in (9).

- (9) strong necessity modal + counterfactual morphology → weak necessity modal

As shown by von Fintel and Iatridou (2008), it is not obvious how to account for this regularity in a compositional way. A suggestion for a formal account for teleological modals is developed by Rubinstein (2012). Other recent formal suggestions for the analysis of weak necessity are developed by Howell (2015) and Silk (2016).

For German, Glas (1984), Brünner and Redder (1983), Diewald (1999) and others have observed that the Konjunktiv II form of a modal can bring about a meaning difference that goes beyond a regular irrealis (or indirect speech) use of Konjunktiv II. Diewald (1999):193ff discussed a weakened meaning of *müsste* relative to *muss*. She made related observations about *soll* and *sollte*, to which we will return.

2.3 The classification of German modals by Bech (1949, 1951) and others

The non-model-theoretic literature on German modals has developed a semantic classification of modal flavour that seems not so far to have found systematic entry into formal semantic analyses (but see Sode and Schenner (2013)). This literature contains two important insights about modal flavour distinctions which will play a role in our discussion.

The first distinction derives from the structuralist analysis of Bech (1949, 1951), and has entered into the later accounts of Brünner and Redder (1983), Glas (1984), Öhlschläger (1989), Diewald (1999) and others. It separates what we here call *individual-related modals* from *proposition-related modals*. In addition to semantically operating on the prejacent, individual-related modals relate their meaning contribution to an individual. One example of

an individual-related modal is the German modal *will* ‘want’.⁸ In the case of root *will*, the relevant individual is the person wanting, the sentential subject, as shown in (10).

- (10) Peter **will** uns etwas mitbringen.
 Peter WANTS us something bring
 ≈ Peter₁ wants [PRO₁ to bring us something].

A second individual-related modal is *soll*. It has a reading that is a variant of *will*, in which the person wanting is implicit and must not be coreferent with the sentential subject. The example in (11) illustrates.

- (11) Peter **soll** uns etwas mitbringen.
 Peter SOLL us something bring
 ≈ We want Peter to bring us something. Or:
 Someone (e.g. Peter’s wife) wants Peter to bring us something.
 ≠ Peter₁ wants [PRO₁ to bring us something].
 ‘Peter is supposed to bring us something.’

The second relevant distinction due to Bech (1949, 1951) separates *will* ‘want’ from *soll* in the way just described: the individual is the subject (*will*) or it is implicit and must not be coreferent with the subject (*soll*). The usefulness of both distinctions can be seen in how they restrict both root and epistemic uses of *will* and *soll*.⁹ Their epistemic use is likewise individual-related: *will*_{EPIST} broadly means ‘according to the sentence subject’, and *soll*_{EPIST} broadly means ‘according to someone other than the sentence subject’.

The individual-related modals *will* and *soll* contrast with the proposition-related modal *muss*: In root use, the meaning of the latter type is related to the content of rules, obligations, etc., i.e. propositions. In epistemic use, the term ‘proposition-related’ points to the proposition(s) from which the prejacent is inferred.

The table in (12) summarizes the contrast between the individual-related modals and the proposition-related modals.

- (12) The classification of some German modals by Bech (1949, 1951), cast in our terms

individual-related	x = subject	implicit x ≠ subject	flavour meaning
	x will p	soll p	root: <i>x wants p</i> (+ deontic uses of <i>soll</i>) epistemic: <i>according to x, p</i>
proposition-related	muss p		root: related to obligations, goals etc. epistemic: inferential

This structures the terrain of German indicative modals in an elegant way. In addition, Bech and later literature assign *soll* the permission counterpart *darf* ‘be allowed to’, and *muss* the possibility counterpart *kann* ‘can’.

⁸ German *will* ‘want’ patterns as a modal: It allows use with a bare infinitive complement and it shows both a root meaning and a distinct epistemic meaning (see e.g. Zaefferer (2001), Gärtner (2012)). The English verb *want* does not share either of these properties.

⁹ Bech (1949, 1951) did not make a distinction between root and epistemic uses and sought for meaning generalizations which applied to both. The elements of Bech’s classification discussed in the text retain their usefulness also with this distinction, since it was intended to generalize across the observed instances of root and epistemic uses.

As a terminological convenience, we adopt the conventions in (13), based on one of Bech’s distinctions in (12): We characterize verbs like *want*, *wish* etc. as *internally bouletic* and individual-related bouletic uses of *soll* as *externally bouletic*. The difference is whether the holder of the desire is identical to the subject of the clause.

- (13) *internally bouletic*: holder of desire = subject of clause
externally bouletic: holder of desire ≠ subject of clause

As previewed in (12) in the rightmost column, Bech (1949) characterized the modal flavour of *soll* as including two uses. We render the content of his prose with the schematic formulas in (14).

- (14) a. $soll\ p \Leftrightarrow x\ wants\ p$, for $x \neq$ the subject of the clause or
b. $soll\ p \Leftrightarrow$ a principle requires p

Of these, (14a) is the individual-related use of *soll* that was illustrated in (11) and is here called externally bouletic. (14b) is an additional deontic use.

A further example of the externally bouletic use in (14a) is shown in (15). It is from the German TV-series ‘In aller Freundschaft’ (April 4, 2017). The subtitles that this series offers do not always render the exact words that are spoken. But as far as the meaning goes, the subtitles are a faithful translation of the spoken words in the context. This semantic equivalence illustrates the meaning correspondence in (14a).

- (15) Dr. Globisch: Ich will nicht, dass Alexander nach München geht.
I want not that Alexander to Munich goes
‘I don’t want Alexander to go to Munich.’
Subtitles: Alexander **soll** nicht nach München gehen.
Alexander SOLL not to Munich go
‘I don’t want Alexander to go to Munich.’

The characterization of the range of flavours attributed to *soll* as externally bouletic and deontic is also found in Ehrich (2001):164,166, as we understand her, and in the reference grammars Zifonun, Hoffmann and Strecker (1997b):1890 and in the *Dudengrammatik* (Fabricius-Hansen (2016):572).

Kratzer (1991) classifies German *soll* as bouletic in a table of modals, though as the details of individual modal flavours are not her focus, she provides no evidence for restricting the modal flavour of *soll* to (14a), excluding deontic options like (14b).

Sode and Schenner (2013) argue that the restriction against x being the sentence subject in (14a) is not a lexical specification of *soll* but the result of competition between *soll* and *will* ‘want’: Where the intended meaning can be expressed by *will*, *will* blocks *soll*.¹⁰

Another aspect worth mentioning is that Sode and Schenner (2013), like Kratzer (1991),

¹⁰ Their argument is that *will* only allows *de se* readings (i.e. in $x\ wants\ [y\ VP]$, x is acquainted under identity with y), and that only *de se* readings are blocked for *soll*, while non-*de se* bouletic readings are actually allowed with *soll*. This would necessitate a revision of (14a), so that it expresses a *de se* restriction rather than a simple coreference restriction. Sode and Schenner’s arguments strengthen the case for a bouletic meaning option for *soll*. For purposes of simplicity, we set the non-*de-se* reading aside here and work with the simpler formulation in (14a).

omit the meaning option in (14b) without argument. One of our contributions will be to provide empirical support for the omission of (14b). We will, however, argue in later sections that even though *soll* only corresponds to (14a), the Konjunktiv II form *sollte* corresponds to a deontic meaning as in (14b). In this we differ from Bech (1949) and much later literature, who take it for granted that *soll* and *sollte* have the same range of modal flavours.

2.4 The divide between bouletic and deontic

We saw in the preceding section that there is controversy over whether the German modal *soll* has bouletic uses, deontic uses, or both. The empirical picture is complicated by the fact that some uses of modals that seem to be deontic may actually be bouletic. The following background is relevant to this.

Condoravdi and Lauer (2012) have argued for a bouletic analysis of the meaning of the imperative, modifying earlier suggestions about a more flexible modal meaning of the imperative by Kaufmann (2012). Building on these authors, Oikonomou (2016) developed a further bouletic analysis of imperatives. Relatedly, Glas (1984) and Hinterwimmer (2015) have discussed similarities between the imperative and German *soll*.

The connection between a hypothesized bouletic lexical meaning and an apparently deontic use is brought out by reasoning on *soll* by Glas (1984):19ff, Öhlschläger (1989):174, and Fritz (1991):287 and by similar reasoning on imperatives by Condoravdi and Lauer (2012): What one person wants may result in an obligation on another person, provided that the first person has authority over the second and provided that this authority extends to the content at hand. In (16), for example, the context provides a request, which includes the utterance of a preference, though it is not inherently an order and a request does not inherently result in an obligation. In (16a), *will* is felicitous because of the preceding request. *Muss* in (16b) can be true because the request can turn into an obligation by inference.

(16) [L asked M to lock the building. Later, M says to P:]

- a. L **will**, dass ich noch das Gebäude abschlieÙe.
L want that I still the building lock
≈ L wants me to lock the building.
- b. Ich **muss** noch das Gebäude abschließen.
I must still the building lock
'I still have to lock the building.'

Furthermore, the same two sentences are possible when the context provides an order, as in (17). If our hypotheses are correct, this is because an order entails a preference, which is what makes the modal in (17a) true; and a successful order brings about an obligation, which makes (17b) true.

(17) [L ordered M to lock the building. Later, M says to P:]

- a. L **will**, dass ich noch das Gebäude abschlieÙe.
- b. Ich **muss** noch das Gebäude abschließen.

To test the modal flavours of *soll* and *muss*, we require different contexts. If we want to be sure that a given modal allows the lexical modal flavour X, rather than Y, we need to employ a context that is compatible with modal flavour X, and, crucially, *not* compatible with modal flavour Y. The test environments we employ below have this property.

3 The modal flavours of *muss* and *soll*

In section 3.1 we present our arguments that root *soll* and *muss* have distinct flavours. In section 3.2 we argue for distinct epistemic flavours of *soll* and *muss*. In section 3.3 we address consequences and related suggestions.

3.1 The root flavours of *muss* and *soll*

We turn now to our tests for distinguishing the root flavours of *muss* and *soll*. (18) explicitly rules out preceding requests (preferences) and introduces a rule that imposes an abstract obligation. It is thus an unambiguously deontic context. Here *muss* is possible in (18a), with reference to the rule/obligation. However, *soll* is not possible in (18b). This is correctly captured if *soll* is limited to the externally bouletic reading in (14a).

(18) [Nobody said anything to M about locking the building. However, there is a rule that you lock the building when you are the last to leave. M says to P:]

- a. Ich **muss** noch das Gebäude abschließen.
I must still the building lock
'I still have to lock the building.' DEONTIC
- b. # Ich **soll** noch das Gebäude abschließen.
I SOLL still the building lock
≈ Someone wants me to lock the building.

In (19) we employ a context that provides a goal of M's. This allows for a teleological deployment of *muss* in (19a). However, the context excludes requests for the preajcent (i.e. explicit preferences by others for the preajcent). This context does not allow *soll*.

(19) [M just received two important emails. She has the goal of not leaving important emails unanswered. Nobody asked her to answer her emails. M calls P and says:]

- a. Ich **muss** noch zwei E-Mails beantworten, bevor ich nach Hause komme.
I must still two emails answer before I to home come
'I just have to answer two emails before I come home.' TELEOLOGICAL
- b. # Ich **soll** noch zwei E-Mails beantworten, bevor ich nach Hause komme.
I SOLL still two emails answer before I to home come
≈ Someone wants me to answer two emails before I come home.

The examples (18b) and (19b) thus provide evidence that *soll* requires someone's preferences as in (14a). They provide an argument that (14b) must be dropped since *soll* does not allow the deontic or teleological modal flavours that *muss* refers to.

The contexts in (20) and (21) have the inverse properties. (20) provides a preference (request) by the daughter. (21) provides a preference (request) by person P. Neither context allows the modals to be related to a rule or obligation. Here *muss* and *soll* reverse in their acceptability.

(20) [M gets a text message (“SMS”) from her daughter, asking M to bring her sweets. P asks about the content of the message. M describes its content as follows:]

a. # Ich **muss** meiner Tochter Süßigkeiten mitbringen.
 I must my daughter sweets bring
 ‘I have to bring my daughter sweets.’

b. Ich **soll** meiner Tochter Süßigkeiten mitbringen.
 I SOLL my daughter sweets bring
 ‘I am supposed to bring my daughter sweets.’ EXTERNALLY BOULETIC

(21) [Professor M is approached by P, a representative of a company, who asks M to advertise one of the company’s products. M feels neither obligation nor inclination to do so but agrees to think about it. While they are still negotiating, M gets a call where the purpose of P’s visit comes up. Professor M describes it as follows:]

a. # Ich **muss** für ein Produkt werben.
 I must for a product advertise
 ‘I have to advertise a product.’

b. Ich **soll** für ein Produkt werben.
 I SOLL for a product advertise
 ‘I am supposed to advertise a product.’
 ≈ P wants me to advertise a product. EXTERNALLY BOULETIC

These contexts only allow an externally bouletic modal flavour. The *muss*-examples are not acceptable in (20a) and (21a). This is evidence that *muss* cannot be deployed with only an externally bouletic modal flavour. The examples (20b) and (21b) provide evidence that *soll*, when it has a context licensing an externally bouletic reading, works fine and does not put additional, deontic, requirements on the context. The contexts would not satisfy such additional demands, but the *soll*-examples are fine in these contexts.

In creating the contexts in (20) and (21) we employed the following considerations. In both cases, the test sentences are characterizations of preceding communications that are requests, in contexts that discourage the assumption that the request could amount to an obligation. Consider, in this connection, the teleological reading of a modified version of (20) in (22). Here the mother seems to have formed a goal in response to the text message: She will bring her daughter sweets. The goal motivates the teleological *muss*-statement.

(22) [M gets a text message from M’s daughter, asking M to bring her sweets. P asks what’s up. M says:]

Ich **muss** noch Süßigkeiten für meine Tochter besorgen.
 I must still sweets for my daughter buy
 ‘I have to buy sweets for my daughter later.’

This implicit reliance on a goal is excluded in (20) by having the test sentence be a characterization of the preceding request. This excludes reference to whatever goals the mother might form in response to the request.

In summary, contexts that allow deontic/teleological but not externally bouletic readings allow *muss* but not *soll*. Contexts that allow externally bouletic but not deontic/teleological readings allow *soll* but not *muss*. This is evidence that *muss* can be deployed with a deontic or a teleological modal flavour, though not with an externally

bouletic one; and that *soll* can be deployed with an externally bouletic modal flavour, though not with a deontic or teleological one.

3.2 Modal flavours of epistemic *muss* vs. *soll*

There is a similarly clear distinction between the modal flavours of *muss* and *soll* in their epistemic uses, as we show in this section.

It is argued by von Fintel and Gillies (2010) and Matthewson (2015a) for English epistemic *must* that it relates to indirect evidence for the prejacent. We think that this converges with Br nner and Redder (1983), who call this use of *muss inferential* (German *inferentiell*). We here adopt this understanding and terminology.

Bochnak and Csipak (2016, 2017) argue that *soll* does not have this inferential use. We strengthen their point with the additional examples in (23) and (24). The inferential use of German *muss* is shown in (23a) and (24a). The unacceptability of *soll* in these contexts in (23b) and (24b) shows that *soll* does not have this inferential use, as argued also by Bochnak and Csipak (2016, 2017).

(23) [I saw Maria going into the kitchen. Nobody said anything about her. I say:]

- a. Maria **muss** in der K che sein.
 Maria must in the kitchen be
 ‘Maria must be in the kitchen.’ INFERENCE
- b. # Maria **soll** in der K che sein.
 Maria SOLL in the kitchen be
 ‘Maria is supposed to be in the kitchen.’

(24) [Detective P asks what the evaluation of the cell-phone location data shows. L answers:]

- a. M **muss** bald in Berlin ankommen.
 M must soon in Berlin arrive
 ‘M has to arrive in Berlin soon.’ INFERENCE
- b. # M **soll** bald in Berlin ankommen.
 M SOLL soon in Berlin arrive
 ‘M is supposed to arrive in Berlin soon.’

Following Ehrich (2001), Faller (2007), Schwager (2008), Schenner (2008), Sode (2014), Bochnak and Csipak (2016, 2017), we classify the epistemic use of German *soll* as reportative (see also the similar suggestion in Zaefferer (2001)). These generative accounts echo closely related accounts of the epistemic use of *soll* in Bech (1949), Glas (1984), Diewald (1999) and others. All these accounts correctly capture that *soll* is not possible in (23b) and (24b), where a reportative reading is excluded by the context. Inversely, the context in (25) allows only the reportative reading of *soll*. The judgments are reversed: *Muss* is no longer possible, but *soll* is allowed. This confirms the reportative meaning of epistemic *soll* and shows that *muss* cannot have the reportative meaning that *soll* employs.

(25) [Heike says that Maria is in the kitchen, but I am not convinced, since I think I would have seen her go into the kitchen. I say:]

- a. # Maria **muss** in der Küche sein (aber ich habe meine Zweifel).
Maria must in the kitchen be (but I have my doubts)
'Maria must be in the kitchen (but I have my doubts).'
- b. Maria **soll** in der Küche sein (aber ich habe meine Zweifel).
Maria SOLL in the kitchen be (but I have my doubts)
'Maria is supposed to be in the kitchen (but I have my doubts).'

REPORTATIVE

The test scenario in (25) provides a report in the context, it provides no source of an inference except for possibly the report itself, and it blocks the possibility that the report is the basis of an inference by letting the speaker doubt the report (which comes with doubting the reported prejacent).

We point out that (25) is not a test environment in which all reportatives are expected to be acceptable, but only those that, like *soll*, do not require a commitment to the prejacent by the speaker (cf. extensive discussion in the evidentials literature on differences between reportatives in this respect; see Faller (2002, 2007), Murray (2009, 2017), Matthewson, Davis and Rullmann (2007), among many others). This is fine for our purposes. The test reinforces that *soll* has a reportative modal flavour without speaker commitment and it shows that *muss* does not have the option of having the same reportative modal flavour without speaker commitment.¹¹

In summary, *muss* and *soll* have different lexical modal flavours in their epistemic uses: *muss* is inferential and *soll* is reportative. Expanding on Bochnak and Csipak (2016, 2017), we are able to separate the two uses.

3.3 Arguments against deontic and uniformly reportative analyses of *soll*

Our results support reducing the meaning of root *soll* to (14a) (externally bouletic), removing (14b) (deontic). We begin here by comparing this with a suggestion of Diewald (1999). While the issue we take up here may be partly orthogonal to her main points,¹² we wish to address Diewald's classification of *soll* as deontic and individual-related, explicated in terms of ordering (German *gebieten*) (pp.120ff). The individual-related aspect of Diewald's classification can correctly rule out *soll* in (18) and (19), where there is no individual issuing an order. However, the deontic 'ordering' aspect would seem to incorrectly also rule out *soll* in (20) and (21), where an ordering-related deontic meaning is not contextually appropriate and where *soll* does not have such a meaning. Similar problems for the deontic account seem to arise in (15) above and in (27)-(29) below.

Let us now return to modal flavour descriptions like those of Ehrich (2001), Zifonun, Hoffmann and Strecker (1997b):1890 and Fabricius-Hansen (2016):572, which allow modal

¹¹ German *muss* is plausibly infelicitous in (25) because it requires something close to a speaker commitment to the prejacent (cf. von Stechow and Gillies (2010), Lassiter (2016) on English *must*).

¹² Diewald (1999) develops a characterization of modal meanings in terms of an origin (such as who wants, allows, or orders something) and an aim (such as who is subject to e.g. an order). She adopts two of Bech's distinctions for the characterization of her origin and extends them to her characterizations of the aim. This allows her to relate the meanings of modals to the meanings of attitude verbs.

flavour overlap between *muss* and *soll*. We think that it is sensible to allow overlap in a descriptive fashion that characterizes the distribution of these modals. However, we think that we have shown that it would not be correct to attribute this overlap to what these modals express. They express distinct, non-overlapping meanings.

Notice that the overlap in distribution also arises in the epistemic domain, as in the example (26) from Ehrich (2001). Here *muss* seems to have a reportative reading, contrary to what we suggested in connection with (25) above.

(26) Es **muss**, nach allem was man hört, so sein, dass der Bewerber nicht gut
it must after all what one hears so be that the applicant not good
spanisch spricht.
Spanish speaks

‘Given what people say, the applicant must speak Spanish badly.’

We believe that (26) – like the root case in (22) above – involves situations that are compatible with more than one different modal flavour. In particular, the reports here allow for an inference supporting the truth of the prejacent, an inference based on the reports. This assessment follows Matthewson (2015a):147f, who argues for English *must* that an indirect inference based on a report is possible so long as the report is considered reliable.

Let us then also briefly return to our methodological considerations from section 2.4. Since we have now presented arguments that *muss* and *soll* have non-overlapping modal flavours, our earlier points that their apparent overlap comes from properties of rich situations that license different (non-overlapping) modal flavours is strengthened. We can thus advocate our methodological points with greater confidence: Context sentences are not reliably direct pointers to the lexical modal flavour that is employed. Instead, contexts need to exclude at least one modal flavour and allow another one, if they are to serve as reliable tests for modal flavour.

We now turn to a recent suggestion about *soll* by Bochnak and Csipak (2016, 2017). They propose a unified analysis of root and epistemic *soll* according to which *soll* is always reportative. As discussed above, the epistemic use of *soll* is consistently reportative; furthermore, in typical examples of root *soll* like our examples (17), (20) and (21), the preference is also *reported* in the context (by the preference-holder in the request), which lends the hypothesis some plausibility. If reportative semantics is a consistent inherent part of the meaning of *soll*, root *soll* might require that some person *x* previously reported a preference of some person *y* for the prejacent (allowing that $x = y$).

However, Bochnak and Csipak themselves notice a possibly problematic example for this from Hinterwimmer (2015), which we reproduce in (27).

(27) [Peter is singing *Yesterday* to his baby daughter.]

A: Why is he doing that?

B: Das **soll** das Baby beruhigen.
that SOLL the baby calm.down
‘It’s supposed to calm the baby down.’

(27) poses a *prima facie* challenge for the unified reportative analysis, since there is no explicit prior report in the context. However, Bochnak and Csipak (2017) propose that Person B in (27) is still relying on a report by Peter about what he prefers, and that such a report must be accommodated if it is not explicit. This proposal faces a greater challenge once we observe that the example also works if B is Peter himself, as in (28).

(28) [P is singing *Yesterday* to his baby daughter.]

M: Why are you doing that?

P: Das **soll** das Baby beruhigen.
that SOLL the baby calm.down
'It's supposed to calm the baby down.'

One might postulate that examples of this kind involve some prototypical or general-knowledge relation between the action and the preference that motivates it. This could conceivably motivate the claim that there was, at one point, a relevant report connecting a similar preference to a similar action. However, a prototypical relation is not required, as (29) shows.

(29) [P is upstairs but has put on loud unpleasant music in the basement.]

M: Why are you doing that?

P: Das **soll** die Mäuse aus dem Haus verjagen.
that SOLL the mice out.of.the house chase
'It is supposed to make the mice leave the house.'
≈ I want the music to make the mice leave the house.

There is no previous report which *soll* relies on in (28) or (29), nor is there a past prototypical one alluded to in (29). (The example from a television show in (15) above is another case where neither a prior report, nor a prototypical relation, seems to be present.)

Our assessment of the situation is therefore as follows. Root *soll* lexically requires a preference, a wanting-relation, as in (14a). Where this is a preference by the speaker, as in (15), (28) and (29), the speaker knows about the preference since it is in the speaker's thoughts. Where the preference is not the speaker's, as in (17), (20) and (21), the speaker needs to know about another person's preference in order to allude to it with the modal. Such preferences are not the kind of attitudes that we assume of other people without having a good reason to assume them. Typically, knowledge about preferences is passed on in linguistic form, e.g. someone can make known what they want in a request. Although preferences cannot normally be visually assessed, a case where another person's preference can be inferred visually is shown in (30). Here, too, *soll* is not reportative.

(30) [Baby M is holding up her arms, looking at P. P is not used to babies and doesn't know what to do. L explains:]

Du **sollst** sie hochheben.
You SOLL her lift.up.
'You are supposed to lift her up.'
≈ She wants you to lift her up.

Thus, our assessment is that root *soll* is not inherently reportative.¹³ The suggestion for a

¹³ A real-life example of bouletic, non-reportative *soll* is given in (i). This sentence was found on a sign in a Berlin neighbourhood in March 2017. Filou is the name of a local bakery which had been given an eviction notice.

(i) Filou **soll** bleiben
Filou SOLL stay
'Filou should stay.'

The statement in (i) crucially does not require anybody to have previously said that Filou

unified reportative analysis of *soll* by Bochnak and Csipak is therefore not successful, in our assessment.

The rich discussions of Ehrich (2001) and of Hinterwimmer (2015) include issues concerning *soll* that are beyond the scope of this paper and that we believe are orthogonal to our purposes at hand. Ehrich discusses the relative scope of negation with modals including *soll*, and Hinterwimmer addresses what may be described as a restriction on certain performative-like deployments of *soll* (see also Glas (1984):Ch.8) We plan to return to some of these issues in future work.

In sum, we argue that the lexical meanings of *soll* are bouletic (root use) and reportative (epistemic use), that *soll* does not have a lexical deontic meaning option and that the epistemic reportative meaning does not generalize to the root use of *soll*.

4 *Sollte*

We now turn to *sollte*, the Konjunktiv II form of *soll*, and its surprising switch in modal flavour relative to *soll*. In subsection 4.1 we deal with root *sollte*, and subsection 4.2 addresses epistemic *sollte*.

Before beginning, we set aside a separate homophonous use of *sollte*, which is the past tense version of *soll*. This use is illustrated in (31). As we expect, this past tense form shares the bouletic modal flavour of its present-tense counterpart *soll*.

(31) M: A month ago my daughter sent me a text.

P: What did the text say?

M: Ich **sollte** ihr Süßigkeiten mitbringen.

I SOLL.PAST her sweets bring

‘I was supposed to bring her sweets.’ EXTERNALLY BOULETIC

In the data to follow, our discourse contexts are unambiguously present tense, so that we can be sure we are investigating the Konjunktiv II *sollte* rather than the past tense one.

4.1 Root *sollte* is the weak necessity version of *muss*

4.1.1 The modal flavour of root *sollte*

We begin with a brief summary of prior (mostly non-formal) claims in the literature about the modal flavour of *sollte*, and then proceed to present the evidence in favour of our own proposal.

Bech (1949) made the surely natural assumption that there is no modal flavour distinction between *soll* and *sollte*. This assumption is also made in much later literature, e.g. Öhlschläger (1989). However, there are also observations about modal flavour distinctions between *soll* and *sollte*.

Glas (1984):76ff argues that root *sollte*, unlike root *soll*, has to express a value judgment. For example, while *Du sollst dir die Haare waschen* lit. ‘You SOLL wash your hair’ expresses that the speaker (or someone else) wants the addressee to wash her/his hair, *Du solltest dir die Haare waschen* ‘You should wash your hair’ is a value judgement about the addressee’s washing her hair. This value judgement, in our terms, is the speaker’s judgement that the prejacent is the best available option, characteristic of weak necessity deontic modals.

should stay. It is acceptable because x (the speaker) has a preference that Filou stays, and x ≠ Filou.

As discussed above, Diewald (1999) takes *soll* to be individual-related deontic. She describes a meaning shift in *sollte* that consists of two aspects: For one thing, as described by Glas (1984), there is a value judgement. For another, there is a weakening of the degree of obligation. These converge with the description of weak necessity deontic as compared to strong necessity deontic in section 2.2. (We think that this is the distinction between *muss* and *sollte*, and we differ from Diewald in regard to the modal flavour of *soll*.)

The reference grammar discussions in Zifonun, Hoffmann and Strecker (1997b):1888ff and Fabricius-Hansen (2016):571ff have not taken up a distinction between the modal flavours of *soll* and *sollte*. *Soll* and *sollte* are used side by side in examples illustrating the modal flavour dimension (though both these sources have a brief discussion of a special deployment of *sollte* in conditionals).

Brünner and Redder (1983):57f have a short description of how they see the distinction between *soll* and *sollte*, which is close to what we will argue for here: They contrast the individual-related root use of *soll* with what we call proposition-related and teleological or deontic uses of *sollte*.

As we run *sollte* through our tests shown in section 3.1, we are led to confirm the brief description of Brünner and Redder (1983):57f (and, for *sollte* but not *soll*, the related descriptions by Glas and Diewald): There is a surprising modal flavour distinction between *soll* and *sollte*, which we anticipate in (32).

- (32) Root *sollte* does not share the bouletic modal flavour of *soll*. Instead, root *sollte* is semantically a weak necessity version of deontic/teleological *muss*.

In (33)-(36), we apply our modal flavour test cases to *sollte*. We repeat the earlier test results for *muss* and *soll* in brackets. In all cases, *sollte* patterns with *muss* and contrasts with *soll*. Thus, *sollte* is fine in contexts providing obligations/goals but not preferences, as in (33) and (34). This shows that *sollte*, unlike *soll*, allows deontic and teleological readings.

- (33) [Nobody said anything to M about locking the building. However, there is a rule that you lock the building when you are the last to leave. M says to P:]

Ich ✓**sollte** (/ ✓*muss*/ #*soll*) noch das Gebäude abschließen.

I SOLLTE (/ *must*/ SOLL) still the building lock

‘I should still lock the building.’

DEONTIC

- (34) [M just received two important emails. She has the goal of not leaving important emails unanswered. Nobody asked her to answer her emails. M calls P and says:]

Ich ✓**sollte** (/ ✓*muss*/ #*soll*) noch zwei E-Mails beantworten, bevor ich nach

I SOLLTE (/ *must* / SOLL) still two emails answer before I to

Hause komme.

home come

‘I should answer two emails before I come home.’

TELEOLOGICAL

Inversely, *sollte* is excluded in contexts providing preferences but not obligations, as in (35) and (36). This shows that *sollte* does not share the externally bouletic reading of *soll*.

(35) [M gets a text message from her daughter, asking M to bring her sweets. P asks about the content of the message. M describes its content as follows:]

Ich #**sollte** (/ #muss/ ✓soll) meiner Tochter Süßigkeiten mitbringen.
 I SOLLTE (/ must/ SOLL) my daughter sweets bring
 'I should bring my daughter sweets.' EXTERNALLY BOULETIC

(36) [Professor M is approached by P, a representative of a company, who asks M to advertise one of the company's products. M feels neither obligation nor inclination to do so but agrees to think about it. While they are still negotiating, M gets a call where the purpose of P's visit comes up. Professor M describes it as follows:]

Ich #**sollte** (/ #muss/ ✓soll) für ein Produkt werben.
 I SOLLTE (/ must/ SOLL) for a product advertise
 'I should advertise a product.' EXTERNALLY BOULETIC

In summary, this section has provided clear evidence that *sollte* does not share the externally bouletic modal flavour of *soll*, and that *sollte* shares instead the deontic/teleological modal flavours of *muss*.

In the next subsection, we address the modal force of root *sollte*.

4.1.2 The force distinction between root *muss* and *sollte*

When we compare *sollte* and *muss*, we see that they behave in every way like a weak and a strong necessity modal, comparable to English *should* vs. *have to*.

The examples in (37)-(39) show tests for contrasting the force of the two modals (Horn (1972), von Fintel and Iatridou (2008)):

(37) Du **solltest** das Geschirr abwaschen, aber du **musst** nicht.
 you SOLLTE the dishes wash but you **must** not
 'You should wash the dishes, but you don't have to.'

(38) Gäste **sollten** ihre Hände waschen, Angestellte **müssen** ihre Hände waschen.
 guests SOLLTE their hands wash employees **must** their hands wash
 'Guests should wash their hands, employees have to wash their hands.'

(39) Du **solltest** deine Hände waschen. Eigentlich **musst** du sogar deine Hände waschen.
 you SOLLTE your hands wash in.fact **must** you even your hands wash
 'You should wash your hands. In fact, you have to wash your hands.'

And (40)-(42) show how the strong necessity modal (here: *muss*) presents the only option in some sense, while the weak necessity modal (here: *sollte*) presents the best option, which is not the only option (Sloman (1970), von Fintel and Iatridou (2008)).

(40) [ICE trains and regional trains go to Saarbrücken.]

P: How do I get to Saarbrücken by train?

M: # Du **musst** einen Regionalzug nehmen.
you must a regional.train take
'You have to take a regional train.' (only option)

M: Du **solltest** einen Regionalzug nehmen.
you SOLLTE a regional.train take
'You should take a regional train.' (best option, e.g. because cheaper)

(41) [Only regional trains go to Tübingen.]

P: How do I get to Tübingen by train?

M: Du **musst** einen Regionalzug nehmen.
you must a regional.train take
'You have to take a regional train.' (only option)

M: # Du **solltest** einen Regionalzug nehmen.
you SOLLTE a regional.train take
'You should take a regional train.' (best option)

Example (42a) supports the claim that *sollte* presents the prejacent as the best option: The continuation cannot assert that there is yet a better option. A comparison case is shown in (42b). The modal *kann* 'can' simply presents the prejacent as an option, not excluding that there are better ones.

(42) a. # Du **solltest** das Geschirr abwaschen, aber es wäre besser, wenn du
you SOLLTE the dishes wash but it would.be better if you
es nicht tätest.
it not did

'You should wash the dishes, but it would be better if you didn't.'

b. Du **kannst** das Geschirr abwaschen, aber es wäre besser, wenn du
you can the dishes wash but it would.be better if you
es nicht tätest.
it not did

'You can wash the dishes, but it would be better if you didn't.'

We conclude that root *sollte* is semantically the weak necessity version of root *musst*.

There may be reason to believe that the modal flavour switch we have detected between *soll* and *sollte* happens for principled or universal reasons. Hohaus and Vander Klok (2017a, b) show for the unrelated language Paciran Javanese that a morpheme which turns strong necessity modals into weak necessity ones applies to deontic, teleological, pure circumstantial and epistemic modals, but not to bouletic ones. A restriction against bouletic weak necessity, if shared by German, could motivate the modal flavour switch from bouletic *soll* to deontic/teleological *sollte*.

We pursue this way of thinking about the modal flavour switch in section 5 below. In the following sub-section, we show that similar results obtain with the epistemic use of *sollte*.

4.2 Epistemic *sollte*

In this section, we show that epistemic *sollte* also has a different modal flavour from epistemic *soll*. It shares the modal flavour of epistemic *muss*. In other words, both root and epistemic *sollte* are semantically weak versions of *muss*, rather than of *soll*.

4.2.1 The modal flavour of epistemic *sollte*

When we run our epistemic modal flavour tests on *sollte*, it patterns again with *muss* rather than with *soll*. The examples in (43) and (44) show that *sollte*, unlike *soll*, allows the inferential use.

(43) [I saw Maria going into the kitchen. Nobody said anything about her. I say:]

Maria ✓*sollte*/(/ ✓*muss*/ #*soll*) in der Küche sein.
Maria SOLLTE(/ must/ SOLL) in the kitchen be
'Maria should be in the kitchen.' INFERENTIAL

(44) [Detective P asks what the evaluation of the cell-phone location data shows. L answers:]

M ✓*sollte*/(/ ✓*muss*/ #*soll*) bald in Berlin ankommen.
M SOLLTE(/ must/ SOLL) soon in Berlin arrive
'M should arrive in Berlin soon.' INFERENTIAL

The example in (45) shows that *sollte* does not share the reportative use of epistemic *soll*.¹⁴

(45) [Heike says that Maria is in the kitchen, but I am not convinced, since I think I would have seen her go into the kitchen.]

Maria #*sollte*/(/ #*muss*/ ✓*soll*) in der Küche sein (aber ich habe meine
Maria SOLLTE(/ must/ SOLL) in the kitchen be but I have my
Zweifel).
doubts
'Maria should be in the kitchen (but I have my doubts).' REPORTATIVE

Thus, epistemic *sollte* is like root *sollte* in that it shares the modal flavour of *muss*, not those of *soll*. The parallel between root and epistemic domains also extends to the modal force distinction between *sollte* and *muss*, as we show in the next subsection.

4.2.2 The force distinction between epistemic *muss* and *sollte*

As described by von Stechow and Iatridou (2008) and Rubinsteyn (2012), epistemic modals also show a force distinction between strong and weak necessity. We find a similar force distinction in the epistemic uses of German *muss* and *sollte*, as shown in (46) and (47).

¹⁴ As discussed, speaker commitment to the prejacent is one possible source of infelicity of a modal expression in this environment. Epistemic *sollte* in (45) does not require speaker commitment; see (49) below. Thus *sollte* seems to be ruled out in this test environment because it requires an inferential interpretation, which is not supported by this test environment.

- (46) [Mary is doing science experiments for school: She holds a large piece of paper, the size of a poster, horizontally and her friend is going to drop a can of juice. Is the paper going to stop the can from falling to the floor, or is it going to rip? Her mom says what she expects:]

Das Papier #**muss** / ✓**sollte** den Fall der Dose aufhalten.
 the paper must / SOLLTE the fall the can stop
 ‘The paper #has to /✓should stop the can’s fall.’

- (47) [Comparison case: As in (46). Is the floor of Mary’s room going to stop the can from falling into the basement of the house? Of course:]

Der Boden in Marias Zimmer ✓**muss** / #**sollte** den Fall der Dose aufhalten.
 the floor in Maria’s room must / SOLLTE the fall the can stop
 ‘The floor in Maria’s room ✓has to/#should stop the can’s fall.’

The force of *muss* and *sollte* can be contrasted in the expected way for a strong/weak necessity pair, as illustrated in (48).

- (48) [L comes up to I and K, who are colleagues of Morris, and asks where Morris is.]

I: Morris **sollte** in seinem Büro sein. Er ist jeden Tag um diese Zeit dort.
 Morris SOLLTE in his office be he is every day at this time there
 ‘Morris should be in his office. He is there every day at this time.’

K: Eigentlich **muss** er sogar in seinem Büro sein. Ich hab ihn vorhin dort
 in.fact must he even in his office be I have him earlier there
 hingehen sehen.
 go see
 ‘Actually, he must be in his office. I saw him go there earlier.’

Furthermore, strong necessity inferential modals do not allow continuation by a statement that things are possibly otherwise. For German *muss*, this is shown in (49a). This contrasts with the weak necessity inferential modal *sollte*, which allows such a continuation, as shown in (49b).

- (49) a. # Morris **muss** in seinem Büro sein, aber möglicherweise ist er auch zu
 Morris **must** in his office be but possibly is he also at
 Hause.
 home

‘Morris must be in his office, but it is also possible that he is at home.’

- b. Morris **sollte** in seinem Büro sein, aber möglicherweise ist er auch zu
 Morris SOLLTE in his office be but possibly is he also at
 Hause.
 home

‘Morris should be in his office, but it is also possible that he is at home.’

Thus, we have seen in this subsection that the observations about root *sollte* extend to epistemic *sollte*: it is a weak version of *muss*, different in modal flavour from *soll*.

German thus shares with English the morphologically idiosyncratic opposition of strong necessity *muss* (English *must*) to weak necessity *sollte* (English *should*), as highlighted in (50). We note the possibility that this is not a coincidence in the history of West Germanic.

(50)	strong necessity	Engl. <i>must</i>	Germ. <i>muss</i>
	weak necessity	Engl. <i>should</i>	Germ. <i>sollte</i>

The table in (51) sums up our results about modal flavour and modal force with *muss*, *soll* and *sollte*. We highlight the modal flavour switches of *sollte* with grey arrows.

(51)	Root		Epistemic	
	rules/goals/obligations	external preferences	inferences	reports
strong necessity	muss	soll	muss	soll
weak necessity	sollte		sollte	

5 Elements of the analysis of the modal flavour switch

In section 5.1 we outline a possible motivation for the modal flavour switch in *sollte*. In section 5.2 we lay out why we think the modal flavour switch is not represented in terms of a separate lexical entry for *sollte* but in terms of an LF-rule. A full analysis of the modal flavour switch is beyond the scope of this paper.

5.1 A possible motivation for the modal flavour switch

Let us pursue the path of looking for an account of the flavour switch in terms of modal flavours that do and don't allow weak necessity. We are led to the following picture: It is possible that bouletic and reportative modal flavours are both incompatible with weak necessity, so that weak necessity in *sollte* leads to a switch to modal flavours that allow weak necessity, i.e. deontic/teleological (root) and inferential (epistemic). Relatedly, the discussion in von Stechow and Iatridou (2008) shows weak necessity for deontic, teleological, and epistemic modal flavours, but none for either bouletic or reportative modal flavours.

What, then, might the *soll*-flavours externally bouletic (root) and reportative (epistemic) have in common that makes them unsuited for weak necessity? And what do the *muss*-flavours deontic/teleological (root) and inferential (epistemic) have in common that allows weak necessity? We can get a step ahead by drawing on Bech (1949) and other non-model-theoretic literature on German modals and its classification of the modals in (12). The contrast is between individual-related modal flavours (those of *soll*), which are not compatible with weak necessity, and the proposition-related modal flavours (those of *muss*), which are compatible with weak necessity.

There is, in fact, a very plausible reason why that might be so: It could be that weak necessity readings involve applying the meaning of the counterfactual morphology to the silent propositional argument of the proposition-related modal flavours. This would immediately explain why weak necessity cannot target individual-related modal flavours: they simply do not have a silent propositional argument to which the counterfactual morphology could be applied.

This role of the Konjunktiv is in fact also anticipated in the brief description of Br nner and Redder (1983):57f that also anticipated our results on *sollte*. These authors write that the Konjunktiv ‘‘problematisiert’’ the goals of the speaker (in a teleological use), i.e. the effect of the Konjunktiv is that the goals of the speaker are not simply taken to be true.

Let us consider what kind of silent propositional arguments we would need for this and what this analysis might look like for some specific examples. The teleological example (8) is repeated here as (52).

(52) [I plan to go to Amherst.]

- a. You **have to** take Route 2. (All other roads to Amherst are closed.)
- b. You **ought to** take Route 2. (It's the best option given an additional criterion, like seeing nice scenery on the way.)

The relevant implicit proposition in (52a) is the goal behind the teleological reading: *You want to go to Amherst*. This goal is taken to be true by the speaker of (52a). In (52b), we would work with a set of goals: *You want to go to Amherst and you want to see nice scenery*. The speaker cannot take these both to be true in the world of evaluation. That may be the effect of the counterfactual morphology with teleological modal flavour: The speaker is relying on goals that are potentially relevant but that can not be taken to be true. This direction of developing the account is closely related to the suggestions of Rubinstein (2012). She suggests that the strong necessity teleological use runs on goals that are shared among the discourse participants while a weak necessity teleological use runs on goals that include a goal that is not shared among the discourse participants.

An application of these considerations to the epistemic modals raises issues that are beyond the scope of this paper. We plan to address them in future work.

We briefly relate this to classical suggestions by Kratzer (1981, 1991) and more recent developments. One might say that Kratzer's original theory employs a proposition-related meaning for all modals (since the conversational background functions do not take individuals as input). More recently, some proposals within the Kratzerian tradition allow individuals to be relevant in determining conversational backgrounds, though in ways different from Bech; see Brennan (1993), Lechner (2005), Kratzer (2012, 2013), among others, and see Hacquard (2011) for an overview and further references. The considerations above can be taken to suggest an extension of these developments. Bech's distinction between (in our terms) individual-related modals and proposition-related ones seems to be important for understanding why the root and epistemic meanings of *soll* (individual-related) are not compatible with weak necessity, while the root and epistemic meanings of *muss* (proposition-related) are compatible with weak necessity.

In summary, we hypothesize that the modal flavour switch observed in root and epistemic *sollte* is related to weak necessity operating on the silent proposition of proposition-related modals like English *must* and German *muss*. If this is right, then individual-related modals like *soll* cannot have weak necessity versions since they do not have this propositional implicit argument.

5.2 Modal flavour switch: a separate lexical entry or an LF-rule?

It might seem natural to postulate a separate lexical entry for *soll*+Konjunktiv II, i.e. *sollte*, as represented informally in (53). The separate lexical entry would represent the distinct modal flavour of weak necessity *sollte*.

- (53) Lexical entry for weak necessity *sollte* (to be rejected)
soll+KONJ.II (*sollte*): weak necessity; deontic/teleological or inferential

There are reasons to think that this would not be the right account. These are discussed in the following.

In their discussion of Greek, von Stechow and Iatridou (2008) show that counterfactual morphology turns a strong necessity modal into a weak necessity modal; however, the weak necessity reading exists side by side with a strong necessity counterfactual reading, occurring in environments in which counterfactual morphology is independently licensed. It seems to us that this co-occurrence should be thought of as the normal case, since there is no reason to think that one of these readings would block the other.

The lexical entry in (53) should similarly not interfere with the combination of bouletic *soll* with counterfactual Konjunktiv II to derive counterfactual bouletic readings. Similarly, it should not interfere with combining bouletic *soll* with the indirect speech use of Konjunktiv II to derive indirect speech bouletic readings.

Empirically, however, while *sollte* has a past tense bouletic reading (cf. (31)), the two expected additional readings as *soll*+Konjunktiv II do not seem to be available.

The example in (54) tests this for the irrealis use of Konjunktiv II. (54a) is a comparison case that illustrates the intended reading. It employs Konjunktiv II in a second guise, put aside otherwise in this paper. Konjunktiv II has a synthetic inflectional form that we are considering throughout, but it also has an analytic form composed of *würde* and the infinitive (comparable to English *would*). The latter is generally somewhat marked with modals, which is also true in (54a). However, apart from the general markedness of this collocation, this particular deployment of *sollen* with synthetic Konjunktiv II is possible in the test scenario. It illustrates an irrealis bouletic reading. Importantly, this irrealis bouletic reading is not available in the test case (54b) with the analytic form *sollte*. Thus, it seems that the lexical item *sollte* does not have an irrealis use that is externally bouletic.

(54) Counterfactual Konjunktiv II on bouletic *soll*

M: If my daughter were at home, she would send me a text.

P: What would the text say?

[M thinks that the text would ask M to bring her daughter sweets. M describes this content as follows:]

a. [?]Ich **würde** meiner Tochter Süßigkeiten mitbringen **sollen**.
 I would my daughter sweets bring SOLL.INFINITIVE
 ‘I would be supposed to bring my daughter sweets.’

COUNTERFACTUAL BOULETIC

b. # Ich **sollte** meiner Tochter Süßigkeiten mitbringen.
 I SOLLTE my daughter sweets bring
 ‘I should bring my daughter sweets.’

ONLY WEAK NECESSITY DEONTIC

The indirect speech use of Konjunktiv II on *sollte* is tested in (56). By way of background, (55a,b) first show how an indirect speech environment supports Konjunktiv I in (55a) and Konjunktiv II in (55b); see Fabricius-Hansen (2016), Sode (2014); there is no meaning difference between (55a) and (55b). (56a) then shows an indirect speech use of Konjunktiv I on *soll*, which is possible. The indirect speech use of Konjunktiv II on *soll* in (56b) seems not to be possible. The modal inevitably shifts to a weak necessity reading.

(55) Indirect speech Konjunktiv I and II

- a. Sie sagt, sie gehe demnächst. (Konjunktiv I)
she says she go.KONJ.I soon
- b. Sie sagt, sie ginge demnächst. (Konjunktiv II)
she says she go.KONJ.II soon

‘She says she will leave soon.’ (both a. and b.)

(56) Indirect speech Konjunktiv I and II on bouletic *soll*

[M gets a text message from her daughter, asking M to bring her sweets. P asks about the content of the message. M describes its content as follows:]

- a. Sie schreibt, ich **solle** ihr Süßigkeiten mitbringen.
She write I SOLL.KONJ.I her sweets bring
≈ She writes that she wants me to bring her sweets.

INDIRECT SPEECH BOULETIC

- b. ?# Sie schreibt, ich **sollte** ihr Süßigkeiten mitbringen.
She writes I SOLL.KONJ.II her sweets bring

‘She writes that I should bring her sweets.’ ONLY WEAK NECESSITY DEONTIC

As discussed, we expect that the lexical entry in (53) would not block these other Konjunktiv II readings of *sollte*.¹⁵ We therefore hypothesize that, instead of such an additional lexical entry, the grammar of German contains LF-rules that derive root and epistemic *sollte* as in (57).

(57) LF-rules:

- [_v *soll*_{BOULETIC+KONJ.II}] → [_v *sollte*_{DEONTIC/TELEOLOGICAL, weak necessity}]
[_v *soll*_{REPORTATIVE+KONJ.II}] → [_v *sollte*_{INFERENCEAL, weak necessity}]

If the rules apply obligatorily, they correctly create the observed weak necessity flavours; in addition, they account for why there is no bouletic form of *sollte* with regular counterfactual or indirect speech Konjunktiv II meanings: All attempts to derive this in the grammar would be converted to weak necessity readings by (57) at LF.¹⁶

Classical cases of LF-rules are quantifier raising and LF wh-movement (Chomsky (1981)). We provide the following two additional candidates for LF-rules to add plausibility to the existence of specific LF-rules like (57).

First, as part of his account of reconstruction, Chomsky (1993) postulates that idioms must be constituents at LF. We think it is not an unlikely scenario that LF-rules impose the idiosyncratic interpretation of idioms at LF, operating on syntactic constituents, and that this is the reason why idioms need to be constituents at LF. Thus, the grammar may contain idiosyncratic LF-rules that impose idiom-interpretation.

¹⁵ In section 6.2.2 we address yet another use of German Konjunktiv II, the polite Konjunktiv of Fabricius-Hansen (2016), analyzed formally by Csipak (2015) as *free factive subjunctive*. We have explored the issue discussed here also for this use of Konjunktiv II, though without finding clear ways of testing it and also with uncertainty about the predictions. We are currently not aware of examples of a free factive subjunctive use of *sollte*.

¹⁶ To be sure, we hope that later developments may allow for deriving the connection between root flavours and corresponding epistemic flavours. With such advances, the two rules in (57) could possibly be collapsed into one.

Second, in German, the polite address form *Sie* ‘you.POLITE’ (singular or plural) behaves in every way like the third person plural pronoun *sie* ‘they’ in the grammar. Its four different case forms match those of the third person plural. All inflectional classes of finite verbs, when agreeing with it in present, past and Konjunktiv forms, show agreement for third person plural. It would be odd to postulate an additional pronoun [2nd person polite] and to assume that all grammatical forms of this additional pronoun and those agreeing with it happen to coincide with those of third person plural. A more natural account is to let *Sie* run through the grammar as a third person plural pronoun, with, say, an additional feature [*], and to add an LF-rule like [3rd pl *]→[2nd polite] that derives its actual meaning as polite reference to the addressee.

In summary, *sollte* does not seem to have Konjunktiv II uses other than the weak necessity use with the modal flavour switch to deontic/teleological. We believe that this supports an account in terms of LF-rules deriving *sollte* rather than an account in terms of an additional lexical entry for *sollte*.

This point is interesting since it suggests that the modal flavour switch discussed here is more than a separate lexical entry that developed long ago in the history of German. Instead, it seems to be an active process in contemporary German.

6 *Müsste*

In this section we address the modal *müsste*, which is morphologically the Konjunktiv II version of *muss*. We show in section 6.1 that epistemic *müsste* is the expected weak necessity version of epistemic *muss*. In section 6.2 we discuss the properties of root *müsste*. The modal flavour tests show that it shares its deontic/teleological modal flavour with *muss*. The modal force tests show some unexpected twists. We will suggest that the results can be analyzed in terms of weak necessity plus interference from what Fabricius-Hansen (2016) calls *polite Konjunktiv*. We will employ the analysis of Csipak (2015) in terms of *free factive subjunctive*.

We begin with the well-behaved epistemic case.

6.1 Epistemic *müsste* is the weak necessity version of *muss*

6.1.1 Modal flavour: Epistemic *müsste* is inferential

Epistemic *müsste* shares the modal flavour of epistemic *muss*: it is inferential, not reportative. This is shown by our epistemic modal flavour tests in (58)-(60).

(58) [I saw Maria going into the kitchen. Nobody said anything about her. I say:]

Maria	✓ müsste (/ ✓muss/ #soll)	in der Küche	sein.
Maria	MÜSSTE/ must/ SOLL	in the kitchen	be
	‘Maria should be in the kitchen.’		INFERENCE

(59) [Detective P asks what the evaluation of the cell-phone location data shows. L answers:]

M	✓ müsste (/ ✓muss/ #soll)	bald in Berlin	ankommen.
M	MÜSSTE(/ must/ SOLL)	soon in Berlin	arrive
	‘M should arrive in Berlin soon.’		INFERENCE

(60) [Heike says that Maria is in the kitchen, but I am not convinced, since I think I would have seen her go into the kitchen.]

Maria #**müsste**(/#muss/ ✓soll) in der Küche sein(aber ich habe meine Zweifel).
Maria MÜSSTE/ must/ SOLL in the kitchen be (but I have my doubts)
'Maria should be in the kitchen (but I have my doubts).' REPORTATIVE

6.1.2 Modal force: Epistemic *müsste* is a weak necessity modal

In their reference grammar, Zifonun, Hoffmann and Strecker (1997a):1270 observe that the Konjunktiv II version of *müssen* is used, among other things, for "Abschwächung im Ausdruck von Wahrscheinlichkeiten" ('weakening in the expression of probabilities'). One of their examples is given in (61) (with glosses and translation added). The intuition is that the *müsste* version expresses a weaker claim than the *muss* version.

(61) Sie **muss/ müsste** meiner Information nach an der Sitzung teilgenommen
she must/ MÜSSTE my information after at the.DAT meeting take.part
haben.
have

'According to my information she must have taken part/probably took part in the meeting.'
Zifonun, Hoffmann and Strecker (1997b):1270

The following example that contrasts the force of *müsste* and *muss* provides support for the claim that epistemic *müsste* is weaker than epistemic *muss*.

(62) [L comes up to I and K, who are colleagues of Morris, and asks where Morris is.]

I: Morris **müsste** in seinem Büro sein. Er ist jeden Tag um diese Zeit dort.
Morris MÜSSTE in his office be he is every day at this time there
'Morris should be in his office. He is there every day at this time.'

K: Eigentlich **muss** er sogar in seinem Büro sein. Ich hab ihn vorhin dort
in.fact must he even in his office be I have him earlier there
hingehen sehen.
go see

'Actually, he must be in his office. I saw him go there earlier.'

Example (63) provides further evidence for the weakness of epistemic *müsste*.

(63) Morris ✓**müsste** (/ #muss / ✓sollte) in seinem Büro sein, aber möglicherweise
Morris MÜSSTE / must/ SOLLTE in his office be but possibly
ist er auch zu Hause.
is he also at home

'Morris should be in his office, but it is also possible that he is at home.'

Thus, our evidence suggests that epistemic *müsste* is a weak necessity version of epistemic *muss*.

6.2 Root *müsste*

6.2.1 Modal flavour: Root *müsste* is deontic or teleological

Root *müsste* shares the modal flavours of root *muss*. We show this in (64)-(67).

- (64) [Nobody said anything to M about locking the building. However, there is a rule that you lock the building when you are the last to leave. M says to P:]

Ich ✓**müsste** (✓*muss*/ #*soll*) noch das Gebäude abschließen.

I MÜSSTE (/ *must*/ *SOLL*) still the building lock

'I am supposed to still lock the building.'

DEONTIC

- (65) [M just received two important emails. She has the goal of not leaving important emails unanswered. Nobody asked her to answer her emails. M calls P and says:]

Ich ✓**müsste** (/ ✓*muss*/ #*soll*) noch zwei E-Mails beantworten, bevor ich nach

I MÜSSTE (/ *must* / *SOLL*) still the emails answer before I to

Hause komme.

home come

'I should answer two emails before I come home.'

TELEOLOGICAL

- (66) [M gets a text message from her daughter, asking M to bring her sweets. P asks about the content of the message. M describes its content as follows:]

Ich #**müsste** (/ #*muss*/ ✓*soll*) meiner Tochter Süßigkeiten mitbringen.

I MÜSSTE (/ *must*/ *SOLL*) my daughter sweets bring

'I should bring my daughter sweets.'

EXTERNALLY BOULETIC

- (67) [Professor M is approached by P, a representative of a company, who asks M to advertise one of the company's products. M feels neither obligation nor inclination to do so but agrees to think about it. While they are still negotiating, M gets a call where the purpose of P's visit comes up. Professor M describes it as follows:]

Ich #**müsste** (/ #*muss*/ ✓*soll*) für ein Produkt werben.

I MÜSSTE (/ *must*/ *SOLL*) for a product advertise

'I should advertise a product.'

EXTERNALLY BOULETIC

The data in (64)-(67) confirm that root *müsste*, like epistemic *müsste*, shares the modal flavours of its base modal *muss*.

Importantly, then, *müsste* shares the modal flavours of *muss* throughout. It contrasts with *sollte* insofar as *sollte* shows a modal flavour switch. Above, we sketched an idea in which the modal flavour switch is related to the incompatibility of the *soll*-flavours with weak necessity. On that analysis, it is expected that *müsste* does not show a modal flavour switch: The meaning of *muss*, as it is proposition-related, is compatible with modulation by weak necessity.

Nevertheless, things get a little more complicated when we turn to the modal force of root *müsste* in the next section.

6.2.2 Modal force: root *müsste* and the free factive subjunctive

We saw in section 4.1.2 that root *sollte* clearly behaves like a weak necessity modal. In this

section we show that the modal force judgements pertaining to root *müsste* can differ from those pertaining to root *sollte*. We outline an account of the differences in terms of interference from the polite Konjunktiv II (Fabricius-Hansen (2016)) or the free factive subjunctive (Csipak (2015)).

First, in environments that require strong necessity, we saw that root *sollte* is deviant (this is repeated in (68b) from (41b)). However, root *müsste* is fine, as shown in (68a).

(68) [Only regional trains go to Tübingen.]

P: How do I get to Tübingen by train?

a. M: Du ✓**musst**/ ✓**müsstest** einen Regionalzug nehmen.
 you must/ MÜSSTE a regional.train take
 ‘You have to take a regional train.’ (only option)

b. M: # Du **solltest** einen Regionalzug nehmen.
 you SOLLTE a regional.train take
 ‘You should take a regional train.’ (best option)

Second, in environments that require weak necessity, where root *sollte* is fine, root *müsste* shows speaker-specific variation in acceptability. We annotate these varying judgements using parentheses. Thus, “(?#)” in (69)-(71) indicates that some speakers find these sentences fully acceptable in the intended reading, while others find them somewhat degraded. Similarly “(#)” in (72) and (73) indicates that some speakers find these sentences fully acceptable in the intended reading, while others find them to be deviant.

(69) [ICE trains and regional trains go to Saarbrücken.]

A: How do I get to Saarbrücken by train?

B: (?#) Du **müsstest** einen Regionalzug nehmen.
 you MÜSSTE a regional.train take
 ‘You should take a regional train.’

(70) (?#) Du **müsstest** das Geschirr abwaschen, aber du bist dazu nicht
 you MÜSSTE the dishes wash but you are to.that not
 verpflichtet.
 obliged

‘You should wash the dishes, but you’re not obliged to.’

(71) (?#) Du **müsstest** deine Hände waschen. Eigentlich **musst** du sogar deine
 you MÜSSTE your hands wash in.fact must you even your
 Hände waschen.
 hands wash

‘You should wash your hands. In fact, you have to wash your hands.’

(72) (#) Du **müsstest** das Geschirr abwaschen, aber du **musst** nicht.
 you MÜSSTE the dishes wash but you **must** not
 ‘You should wash the dishes, but you don’t have to.’

- (73) (#) Gäste **müssten** ihre Hände waschen, Angestellte **müssen** ihre Hände
 guests MÜSSTE their hands wash employees must their hands
 waschen.
 wash

‘Guests should wash their hands, employees have to wash their hands.’

We tentatively relate these irregularities to what is called *polite Konjunktiv II* in Fabricius-Hansen (2016):532f. These effects are investigated by Csipak (2015), who argues that not politeness but tentativeness plays a role. She refers to this phenomenon as *free factive subjunctive*, in the following *FF-subjunctive*.

Csipak (2015) postulates a productive use of Konjunktiv II morphology over and above the standard uses as reportative and irrealis that are described by Fabricius-Hansen (2016). In the current context, this is also over and above the weak necessity deployment we see with *sollte* and *müsste*. An example of FF-subjunctive is given in (74).

- (74) [The speaker just opened the fridge, so she is confident that she knows its contents.
 Among the contents of the fridge is some leftover pizza.]

Es **wäre** Pizza im Kühlschrank.
 it be.KONJ.II pizza in.the fridge

‘There is pizza in the fridge.’

(Csipak 2015:25-26)

Csipak (2015) suggests a semantic interpretation for this subjunctive in which the asserted meaning is identical to the asserted meaning of the same sentence with indicative morphology. In (74), for example, the speaker is committed to the truth of the prejacent (‘there is pizza in the fridge’) in the actual world, despite the morphological Konjunktiv II. To this, presuppositional requirements and non-truth-conditional or ‘use-conditional’ content (cf. Potts (2005, 2007), McCready (2010), Gutzmann (2012, 2015), among others) are added. These additional components are motivated in detail and formalized by Csipak (2015); we discuss them informally here. The additional components of meaning require a *decision problem* in the context (such as the issue of what the speaker is going to eat in (74)); furthermore, they amount to the presentation of the prejacent as a possible (thus tentative) unique action alternative: an action that solves the decision problem and that is considered desirable to the agent who has the decision problem. In our example, the action alternative is to open the fridge and eat pizza.

Csipak explicitly refrains from attempting to apply her analysis to modals (see pp. 164-165). We are here led to explore such an application. We suggest that the FF-subjunctive is allowed in (68a) above, with the decision-problem being how P gets to Tübingen by train. What is asserted according to Csipak’s account is the indicative version of the sentences with FF-subjunctive. In the *müsste*-example in (68a) the indicative version is the corresponding *muss*-statement. This is acceptable since the environment is one that allows strong necessity. On the other hand, the FF-subjunctive does not save *sollte* in (68b). In this case, the corresponding indicative version employs *soll*, an externally bouletic modal that is not licensed in this context. Thus, both the unexpected acceptability of *müsste* in (68a) and the contrast to *sollte* can be plausibly captured in terms of FF-subjunctive.

We turn now to the variability in (69)-(73). We think that these judgment differences between speakers reflect whether the Konjunktiv II on *müsste* has only the FF-subjunctive interpretation, or whether in addition an ordinary weak necessity interpretation is available. The weak necessity interpretation would be shared with epistemic *sollte*. Speakers with only the FF-subjunctive interpretation find that *müsste* is degraded in the weak necessity contexts

in (69)-(73), while speakers who allow the weak necessity interpretation find (69)-(73) fully acceptable.

In summary, it is perhaps not unreasonable that the irregularities found with *müsste* are in one way or another related to the FF-subjunctive. Much remains to be explored in this area.

With some tentativeness related to the modal force of root *müsste*, we are thus led to the more complete picture in the following table. The grey arrows still highlight the modal flavour shift with *sollte*. The weak necessity *müsste* that is not available for all speakers is placed in parentheses.

(75) German	Root		Epistemic	
	rules/obligations/goals	external preferences	inferences	reports
strong necessity	muss müsste FF-subj.	soll	muss	soll
weak necessity	(müsste) sollte ←		müsste sollte ←	

6.3 A temporal restriction on epistemic *sollte* and *müsste*

In this section we show that epistemic *sollte* and *müsste* share a temporal restriction with English *should*.

Matthewson (2015b) shows that English epistemic *should* obeys the temporal restriction formulated in (76).

(76) Restriction on English epistemic *should*: The evidence from which the inference is drawn must temporally precede the time of the prejacent event. (Matthewson 2015b)

The examples in (77)-(81) from Matthewson (2015b) illustrate this restriction; see also Copley (2006) for relevant discussion (and see Yalcin (2016) on the difference between *should*—when it is licensed—and *probably*). In (77)-(79) the time of the evidence fails to precede the time of the prejacent, and *should* is infelicitous. In (79), for instance, the speaker’s evidence is the expressions on the doctor’s faces, which do not precede the time at which M’s being sick is assessed. Notice that the difference in acceptability between *must* and *should* is not directly a matter of modal force in these environments. *Should* is infelicitous in these contexts, no matter what level of certainty is involved.

(77) [I meet a friend who I haven’t seen for a while. I say:]

You ✓**must**/ #**should** have had a haircut.

(78) [I see some people looking for open windows in your apartment. I say:]

They ✓**must**/ #**should** be burglars.

(79) [P visits M in the hospital. P sees through the window of the hospital room that the doctors look worried. P says:]

She ✓**must**/ #**should** be very sick.

In contrast, in (80) and (81), the time of the evidence precedes the time of the prejacent eventuality and the use of *should* is well-formed. In (80), the poisoning precedes the time at which M is taken to be sick. In (81), my friend’s assessment of her situation precedes the

estimated time of arrival. (The infelicity of *must* in (81) is a separate temporal fact about epistemic *must* which goes beyond our current concerns; see Portner 2009:235.)

(80) [P poisons M's food and leaves. Later, P says:]

M ✓**must**/ ✓**should** be very sick now.

(81) [My friend is late. She calls me and says:]

I #**must**/ ✓**should** be there at about 1:30.

German *sollte* and *müsste* share the temporal restriction of English *should*. This is shown in the following examples. Like *should*, German *sollte* and *müsste* are not possible in the contexts in (82)-(84).

(82) [I meet a friend who I haven't seen for a while. I say:]

Du ✓**musst**/ #**solltest**/ #**müsstest** beim Friseur gewesen sein.
 you must/ SOLLTE/ MÜSSTE at.the hairdresser been be
 'You ✓must / #should have been to the hairdresser.'

(83) [I see some people looking for open windows in your apartment. I say:]

Sie ✓**müssen**/ #**sollten**/ #**müssten** Einbrecher sein.
 they must/ SOLLTE/ MÜSSTE burglars be
 'They ✓must / #should be burglars.'

(84) [P visits M in the hospital. P sees through the window of the hospital room that the doctors look worried. P says:]

Sie ✓**muss**/ #**sollte**/ #**müsste** sehr krank sein.
 she must/ SOLLTE/ MÜSSTE very sick be
 'She ✓must/ # should be very sick.'

The examples (85) and (86) are well-formed comparison cases corresponding to the English examples (80) and (81) above.

(85) [P poisons M's food and leaves. Later, P says:]

Sie ✓**muss**/ ✓**sollte** jetzt sehr krank sein.
 she must/ SOLLTE/ MÜSSTE now very sick be
 'She must/ should be very sick.'

(86) [My friend is late. She calls me and says:]

Ich #**muss**/ ✓**sollte**/ ✓**müsste** bis 13.30 Uhr da sein
 I must/ SOLLTE/ MÜSSTE by 13.30 o'clock there be
 'I must/ should be there at about 1:30.'

These observations on German are summed up in (87).

(87) In their epistemic use, German *sollte* and *müsste* share the temporal restriction of English *should* in (76): The evidence from which the inference is drawn must temporally precede the time of the prejacent event.

This shared property of English *should* and German *sollte/müsste* strengthens the parallel between the two languages that we highlighted in (50).

7 Modal flavours in English modals

In this final section we provide a comparison between German and English, by applying our diagnostic tests to the English modals *have to*, *should* and *be supposed to*. We choose *have to* rather than *must* for our strong necessity modal, as *must* is subject to register effects which make it degraded for many speakers in ordinary discourse contexts. In this section we set aside modal force and concentrate on establishing the flavours allowed by the three modals.

Our results will show that *have to* and *should* are very parallel to German *muss* and *sollte/müsste* in their modal flavours, and that *be supposed to* shares the uses of German *soll*. We will slightly refine Bochnak and Csipak (2016, 2017)'s proposal that English *be supposed to* and German *soll* are semantic counterparts insofar as *be supposed to*, but not *soll*, has also a deontic use. To our knowledge these claims have not been made before for these English modals.

7.1 Root favours

In our deontic context in (88), all three of the English modals are felicitous.

(88) [Nobody said anything to M about locking the building. However, there is a rule that you lock the building when you are the last to leave. M says to P:]

I ✓**have to**/ ✓**should**/ ✓**am supposed to** lock the main door. DEONTIC

In the teleological context in (89), *have to* and *should* are fine, but *be supposed to* is unacceptable.

(89) [M just received two important emails. She has the goal of not leaving important emails unanswered. Nobody asked her to answer her emails. M calls P and says:]

I ✓**have to**/ ✓**should**/ #**am supposed to** answer two emails before I come home. TELEOLOGICAL

Be supposed to is also infelicitous in standard teleological scenarios. A: *I want to go to Harlem*. B: ?# *You are supposed to take the A-train*. Here B's response does not have the teleological reading that we saw for *have to* in (5b). It only has a reportative reading that is not connected to the specified goal.

Conversely in externally bouletic contexts as in (90) and (91), only *be supposed to* is good and the other two modals are inappropriate. In (90) it is critical to bear in mind that *have to* and *should* are bad as long as M is describing the content of the note. *Have to* and *should* become acceptable here if the speaker has decided to adopt her daughter's preferences as an obligation on herself or her own goal (cf. the similar discussion for German above).

(90) [M gets a text message from her daughter, asking M to bring her sweets. P asks about the content of the message. M describes its content as follows:]

I #**have to**/ #**should**/ ✓**am supposed to** bring sweets for my daughter. EXTERNALLY BOULETIC

- (91) [Professor M is approached by P, a representative of a company, who asks M to advertise one of the company's products. M feels neither obligation nor inclination to do so but agrees to think about it. While they are still negotiating, M gets a call where the purpose of P's visit comes up. Professor M describes it as follows:]

I **#have to/ #should/ ✓am supposed to** advertise a product.

EXTERNALLY BOULETIC

In comparison with German, then, *have to* and *should* are similar to *muss* and *sollte* in terms of their modal flavour.

According to Portner (2009), the modals *have to* and *should* allow the priority modal flavours deontic, teleological and bouletic. Our result that *have to* and *should* cannot take on externally bouletic readings calls for a refinement of this analysis.

As mentioned above, Bochnak and Csipak (2017) have suggested that English *be supposed to* and German *soll* are semantic counterparts. The data above require us to refine this as follows for root modals: Root *be supposed to* shares the externally bouletic option with *soll*, but differs from *soll* in also allowing a deontic modal flavour.

7.2 Epistemic flavours

Turning now to the epistemic modal flavours, we show in (92) and (93) that *have to* and *should* allow an inferential reading while *be supposed to* does not.

- (92) [I saw Maria going into the kitchen. Nobody said anything about her. I say:]

‘Maria **✓has to/ ✓should/ #is supposed to** be in the kitchen.’

INFERENCEAL

- (93) [Detective P asks what the evaluation of the cell-phone location data shows. L answers:]

‘M **✓has to/ ✓should/ #is supposed to** arrive in Berlin soon.’

INFERENCEAL

Inversely, (94) shows that *be supposed to* allows a reportative reading without speaker commitment while *have to* and *should* do not.

- (94) [Heike says that Maria is in the kitchen, but I am not convinced, since I think I would have seen her go into the kitchen.]

‘Maria **#has to/ #should/ ✓is supposed to** be in the kitchen (but I have my doubts).’

REPORTATIVE

With epistemic modal flavours, *have to* and *should* are thus directly parallel to German *muss* and *sollte/müsste*, and *be supposed to* is parallel to German *soll*.

The results of our tests for English are summarized in (95). We have not done the modal force tests here, but we rely on the established classification of *must* as strong necessity and *should* as weak necessity (e.g., Copley (2006)).

(95) English	Root			Epistemic	
	goals	rules	external preferences	inferences	reports
strong necessity	have to		be supposed to	have to	be supposed to
weak necessity	should			should	

8 Conclusion

We have argued that modal flavour is most usefully tested in environments that provide what one modal flavour requires while excluding what another modal flavour requires. Using tests of this kind, we motivate the classification in table (96), repeated from (75).

(96) German	Root		Epistemic	
	rules/obligations/goals	external preferences	inferences	reports
strong necessity	muss	soll	muss	soll
	müsste FF-subj.		müsste	
weak necessity	(müsste) sollte ←		sollte ←	

Thus, *muss* and *soll* have non-overlapping lexical modal flavour options. Surprisingly, *sollte* does not share the lexical modal flavours of *soll*, but those of *muss*. It is semantically a weak necessity version of *muss*. We argued that *müsste* is also a weak necessity version of *muss*, with interference of the FF-subjunctive of Csipak (2015) in its deontic use.

Our results strengthen the bouletic classification of *soll* by Kratzer (1991) and by Sode and Schenner (2013) and establish that the deontic modal flavour suggested as an additional option for *soll* by Bech (1949) is instead specific to its Konjunktiv II form *sollte*, which has given up the bouletic specification.

In a general way, our results also strengthen the morphological correlation postulated by von Fintel and Iatridou (2008). In the domain investigated here, weak necessity is only found with counterfactual morphology, here Konjunktiv II (*sollte*, *müsste*).

We also applied our tests to English. While *have to* and *should* are similar to German *muss* and *sollte*, English *be supposed to* shows similarities with *soll*, as discussed by Bochnak and Csipak (2017), but also a distinction: unlike German *soll*, English *be supposed to* allows deontic use (see the table in (95)).

Our results point in two directions, which we plan to explore in future work. First, taking into account the results of Hohaus and Vander Klok (2017a, b), it seems that weak necessity is restricted to proposition-related modals, to the exclusion of bouletic and reportative modals; this may be the trigger for the modal flavour switch from *soll* to *sollte*. Second, it seems that the counterfactual morphology in weak necessity operates on the implicit propositional argument of the modal.

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