OF MONSTERS AND MODALS[*]

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1.   Introduction

Kratzerian semantics (Kratzer 2012) treats epistemic possibility and necessity as entirely analogous to one another. Both involve quantifying over a set of (possibly ordered) worlds, and asserting that their prejacent is true in those worlds. Despite their similarity in structure, epistemic possibility and necessity in English show a distributional asymmetry. This paper aims to account for one such asymmetry.

Egan et al. (2005) present a use of an unembedded epistemic modal where the speaker's knowledge is not relevant to the modal base:

> Ann is planning a surprise party for Bill, but Bill has found out. Bill and Chris are at Chris' apartment watching Ann walk past, carrying a large supply of party hats. She sees a bus on which Bill frequently rides home, so she jumps into some nearby bushes to avoid being spotted. Chris is puzzled and asks Bill why Ann is hiding in the bushes. Bill says

(1)   I might be on that bus.   (adapted from Egan et al. 2005: 140)

What Bill means in example (1) is that in all worlds that are accessible to Ann, he is on that bus. Thus we see that the modal base for *might* in (1) is not the epistemic or doxastic alternatives of Bill, but those of Ann. Curiously, if we change the set-up slightly so as to use a necessity modal, something interesting happens. Consider a parallel example below:

> Set-up is largely the same, except Ann and Bill spoke to each other as Bill was getting on the bus. The bus route has a large meander near Chris' apartment, and unbeknownst to Ann, Bill got off before the bus started the loop and walked to Chris' apartment. Ann sees the bus as it comes back from the loop, and thinking Bill is on the bus, hides. Chris asks why Ann is hiding. Bill says

(2)   # I must be on that bus.

Example (2) can only mean that in all worlds conforming to Bill's beliefs, he is on that bus. Unlike in example (1), it is not possible for the modal base to consist of worlds accessible to

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Ann. It seems then, that the modal base for *must* necessarily includes the speaker, whereas the modal base for *might* need not.

In this paper I will consider proposals to account for why epistemic possibility in English need not be speaker-inclusive, but epistemic necessity in English must be speaker-inclusive. The rest of this paper is organised as follows. In section 2, I will consider two proposals to account for the relevant facts. First a judge-dependent analysis with an added uncertainty presupposition, and then a lexical solution involving indexical shift. In section 3 I set out definitions and notations required for my proposal, before using the proposed account to explain the data in section 4. The paper ends with a brief discussion of next steps along this path of inquiry, and possible extensions of this analysis.

2.   Possible accounts

This section considers possible accounts for the speaker-exclusive reading of *might*. The first task is to account for a speaker-exclusive point of assessment as we see in example (1). Once that is accounted for, we must also explain why this reading is not available for *must*. I begin by looking at a proposal for predicates of personal taste, which allows for the kind of divergent points of assessment that may be useful.

2.1   Judges and uncertainty

In order to account for the speaker-exclusivity of *might*, we must quantify over the set of worlds accessible to someone other than the speaker, perhaps by means of a shiftable parameter. Stephenson (2007) does just this in developing a semantics for predicates of personal taste. This proposal includes a judge parameter in it's evaluation. Propositions are evaluated relative to a tuple $\langle w, t, j \rangle$, where w represents a world, t a time, and j the judge. The judge provides a mechanism to explain a speaker-exclusive point of assessment.

In the speaker-exclusive use of *might*, Stephenson proposes that ellipsis is occurring, and when Bill utters (3a), what is underlying is (3b).

(3)   a. I might be on that bus.

b. ~~Ann is hiding in the bushes because~~ I might be on that bus.

Stephenson further proposes that the operator *because* manipulates the judge parameter so that the relevant assessor becomes Ann in the complement of *because*.[1] Subsequently, the semantics for the modals are able to pick up on the relevant judge, and thus has a speaker-exclusive reading.

Stephenson's lexical entries for *might* and *must* are given below:

(4) $[\![\text{might}]\!]^{w,t,j} = \lambda p. \exists \langle w', t', x \rangle \in \text{EPIST}_{w,t,j} : p(w')(t')(x) = 1$

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[1]Stephenson uses a null referential pronoun as an argument of *because* and modifies the judge of the complement clause to this individual. The null pronoun then picks out Ann as its referent due to salience. The details of the implementation are not crucial.

(5) $[\![\text{must}]\!]^{w,t,j} = \lambda p. \forall \langle w', t', x \rangle \in \text{EPIST}_{w,t,j} : p(w')(t')(x) = 1$

Where $\text{EPIST}_{w,t,j}$ are the epistemic alternatives of j in w at t.

Note that both modals quantify over the epistemic alternatives of the judge in a given world, at a given time. This means that as per this proposal, both epistemic possibility and necessity should behave the same way when in such an ellipsis construction. Consider a Stephensonian analysis of epistemic necessity in a similar set-up as example (2).

(6) ~~Ann is hiding in the bushes because~~ I must on that bus.

As before, we have *because* manipulating the judge parameter of its complement, and then *I must be on that bus* is evaluated relative to Ann as the judge. The set of accessible worlds that are being quantified over are Ann's set of epistemic alternatives. Then this statement could be paraphrased as 'In all worlds compatible with Ann's epistemic alternatives in the real world now, I am on that bus.' But this predicts a speaker-exclusive reading of *must* in the same contexts as for *might*, and it was noted that such a reading is unavailable.

In order to prevent a speaker-exclusive reading of *must*, some modifications to this judge-dependent account will need to be made. To do this, we can draw from another domain in which the epistemic modals show a similar distribution, namely epistemic possibility being permissible in an environment where necessity is not.

Anand and Hacquard (2013) note the same distribution for epistemic modality under attitude verbs. For some English speakers, the possibility modal can be embedded under emotive doxastics, but the necessity modal cannot. Consider the example below.

(7) a. The doctors fear that it might be cancer.

b. # The doctors fear that it must be cancer.[2]

In order to account for this asymmetry, Anand and Hacquard propose that there is an uncertainty presupposition in the emotive doxastic, which requires that the doxastic alternatives of the speaker contain worlds that verify, and worlds that falsify the complement of the verb. For a modal *Mod*, they state that *Mod p*-verifying worlds are the same as *p*-verifiers (Anand and Hacquard, 2013: 34). The meaning of *must p* is that all the worlds in the doxastic alternatives of the speaker are *p*-verifiers. Thus a proposition including both an emotive doxastic and epistemic necessity like *fear must p* leads to a contradiction. The presupposition requires that there be at least one *p*-falsifier in the doxastic alternatives, but the modal requires that there be only *p*-verifiers.

It should be possible to construct a similar account for our speaker-exclusive case by modifying Stephenson's (2007) proposal. We could propose an operator with same uncertainty presupposition as the one Anand and Hacquard propose for emotive doxastics.[3]

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[2]This sentence is not degraded in my opinion. See Ippolito (in prep.) for an analysis of such construction in English and Italian for speakers who accept them.

[3]Whether this presupposition is in a covert operator or part of *because* is unimportant, since neither can account for all the data, as we shall soon see

This theory predicts then that there could be two types of languages: those that have the uncertainty presupposition, and those that do not. Languages with the uncertainty presupposition will not permit a speaker-exclusive use of *must*, and those without the presupposition will allow it. Since an uncertainty presupposition is compatible with existential quantification, this theory crucially provides no mechanism to account for a language that does not permit even a speaker-exclusive use of the epistemic possibility modal. Unfortunately for this theory, such languages do indeed exist, and Kinyarwanda is one of them. Consider the data below, collected by me on October 26th, 2015.[4]
[Context as in (2). *Why is Ana hiding in the bushes?*]

(8)   *#(Ana abaza   ko)   mbgirizwa   kuba   muri irjya*
         #(Ana a-∅-baz-a   ko)   n-∅-bgirizu-a   ku-ba   muri i-rjya
         #(Ana 3SG-PRES-think-IPFV that) 1SG-PRES-must-IPFV INF-COP LOC NC6-that

         ibisi
         i-bisi
         NC6-bus

       #(Ana thinks that) I must be on that bus

Example (8) shows that the speaker-exclusive necessity modal is unavailable in Kinyarwanda, as with English. In order to force a speaker-exclusive assessment, the sentence must be overtly embedded under an attitude report. Turning now to epistemic possibility, we see that English and Kinyarwanda diverge.
[Context as in (1). *Why is Ana hiding in the bushes?*]

(9)   *#(Ana abaza   ko)   nshobora   kuba   muri irjya*
         #(Ana a-∅-baz-a   ko)   n-∅-shobor-a   ku-ba   muri i-rjya
         #(Ana 3SG-PRES-think-IPFV that) 1SG-PRES-might-IPFV INF-COP LOC NC6-that

         ibisi
         i-bisi
         NC6-bus

       #(Ana thinks that) I might be on that bus

Like epistemic necessity in Kinyarwanda, epistemic possibility in Kinyarwanda is also speaker-inclusive by default. Example (9) shows that the speaker-exclusive reading of the possibility modal requires an overt embedding under an attitude report. As noted, a judge-based analysis with an uncertainty presupposition would predict that such languages should not exist. Since this theory cannot account for both the English and Kinyarwanda data, we will need to try some other means of both accounting for the speaker-exclusive possibility modal in English, while barring a speaker-exclusive necessity modal. Furthermore, this proposal will need to be flexible enough to account for why neither modal in Kinyarwanda can be speaker-exclusive when unembedded.

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[4]Thanks to Jean-Claude Mugisha for his judgements on Kinyarwanda.

2.2 Indexicals and monsters

In the previous section, the proposal tried to develop a restriction on the use of speaker-exclusive epistemic necessity through the interaction between the modal and the environment. That approach was shown to not be sufficiently flexible. In this section, I shall propose that the difference is lexicalised, and thus a property of the modals themselves. This is to say that the meaning of *must* shall be such that it is less variable than that of *might*.

The possibility modal allows flexibility in that it can be speaker-inclusive or exclusive, but the necessity modal is always speaker-inclusive. If we squint, this sort of looks like indexicality in the nominal domain.

Following Kaplan (1977), anaphors come in two sorts. Indexicals are those whose referents are fixed to the context of utterance, and pronouns are those whose referents can be freely shifted. Theories involving indexicality require a pair of parameters, the context and the index. As per von Stechow (2004), the context and index are both triples consisting of individuals, worlds, and times. In the context, these are $\langle a*, w*, t* \rangle$ where $a*$ is the author or speaker, $w*$ is the real world, and $t*$ is utterance time.[5] The index contains an individual, a world, and time that are salient to the utterance in some way. Operators can modify the index, but traditionally not the context, and anaphors may draw their referents from either parameter. Indexicals draw their referents from the context, while pronouns draw their referents from the index. Since the index is easily shifted by operators, pronouns also shift. Indexicals usually do not shift, because the context is not easily shiftable.

I propose that *must* is always context dependent, but *might* can be made to depend on index. Since operators can modify the index, *might* can have varied modal bases. In this way, I can capture the ability to shift the modal base of *might* but not that of *must*. In the subsequent sections, I shall outline the details of my proposal and discuss how it can account for the data at hand. But first, one small issue remains to be dealt with.

As it stands, my proposal puts epistemic necessity in English on par with indexicals like *I*. But indexicals and epistemic necessity behave differently when embedded under attitude reports.

(10)   a. John thinks I am a baker.

b. John thinks it must be raining.

In example (10a), the anaphor must refer to the speaker, even when embedded under the attitude report. Contrast this with example (10b), where the modal base for *must* consists of worlds accessible to John, not the speaker. So with the current proposal, it remains to be explained how the modal base can be built upon the knowledge of an individual other than the speaker in those cases where the modal is embedded under an attitude verb.

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[5]Sometimes, an addressee is also included in the parameters, but von Stechow argues that the addressee can be reconstructed from just the three co-ordinates he includes. I will follow his lead, if only to avoid having to type an extra co-ordinate every time.

Fortunately, claiming attitude verbs are monstrous and cause such shifts in the context is not unheard of. In fact, Schlenker (2003) argues for just that. In his 2006 thesis, Anand implements context-shifting attitude reports by using monstrous diagonalisation operators selected by attitude verbs. A diagonalisation operator is one which overwrites the context with co-ordinates from the index. Anand specifically considers the case of shifting the first person indexcial anaphor in Amharic. The idea is that in Amharic, an attitude report optionally selects the diagonalisation operator, which overwrites the author co-ordinate of the context by that of the index.

I propose that English attitude reports like *think* also select a monstrous diagonalisation operator, with one key difference. Unlike the Amharic diagonalisation operator, the English one does not shift the individual in the context, but the world co-ordinates.[6]

3. Definitions

In this section, I will outline the details of my proposal, and the definitions necessary in order to account for the data presented. Firstly, a slight revision of von Stechow's conceptualisation of index and context are in order. I propose that instead of containing a single world parameter, both the index and the context contain a parameter which is a set of worlds. Thus the context is $c = \langle a*, \mathrm{Dox}_{a*}, t* \rangle$, here $a*$ is the author/speaker, Dox_{a*} is the set of doxastic alternatives of the speaker, $t*$ is utterance time. Likewise, the index is $i = \langle e, W, t \rangle$ where e is a salient individual, W is a salient set of worlds, and t is a salient time.

The decision to use a set of worlds instead of a single world is motivated by both practical and theoretical concerns. From the practical perspective, it is easier to create a context or index dependent modal base if the context and index consist of a set of worlds to begin with. From a theoretical perspective, I follow Alonso-Ovalle and Menéndez-Benito (2010), in assuming that all assertions are implicitly modalised with respect to the doxastic alternatives of the speaker. Rather than saying that a declared proposition is true in the real world, we would then say that the declared proposition holds in all of the speaker's doxastic alternatives. For this reason, I replace the real world co-ordinate in the context with the doxastic alternatives of the speaker. For simplicity, I will not include the extra level of quantification introduced by Alonso-Ovalle and Menéndez-Benito's ASSERT operator in my computations, but this universal quantification over the speaker's beliefs is assumed to be present.

One other point of note is the use of doxastic alternatives instead of epistemic alternatives. This is done to leave room for false beliefs. Since epistemic alternatives depend on knowledge rather than belief, they are by definition true. This means that retractions of statements with universal quantification over an epistemic modal base should not be possible, but it is. Since a set of doxastic alternatives consists of belief worlds, and having false

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[6]Recall that the context and the index have co-ordinates for an individual, a world, and a time.

beliefs is entirely possible, we do not encounter the same theoretical problem.[7]

Now let us consider the lexical entries for the modals in English. I propose that *might* can depend on either the context or the index, while *must* depends solely on the context in order to form the modal base. Lexical entries are given below.

(11) $[\![\text{might}]\!]^{c,i} = \left\{ \begin{array}{l} \lambda p. \exists w' \in \text{Dox}_{a*} : [\![p(w')]\!]^{c,i} = 1 \text{ if } \text{Dox}_{a*} \text{ does not settle } p \\ \lambda p. \exists w' \in W : [\![p(w')]\!]^{c,i} = 1 \text{ otherwise, where } W \in i \end{array} \right.$

(12) $[\![\text{must}]\!]^{c,i} = \lambda p. \forall w' \in \text{Dox}_{a*} : [\![p(w')]\!]^{c,i} = 1$

Note that the entries for the two modals are not analogous. The necessity modal quantifies over the set of worlds in the context, which in normal circumstances will be the doxastic alternatives of the speaker, and in embedded contexts will be whatever the diagonalisation operator has written into the context. Contrast this with the possibility modal, which has the ability to accommodate its lexical entry depending on the prejacent. If the doxastic alternatives of the speaker do not settle[8], the modal involves quantification over the doxastic alternatives of the speaker. Just in case the speaker's beliefs do settle the prejacent of the modal, the quantification then happens over the salient set of worlds in the index instead. By allowing for the possibility modal to draw a modal base from the index, I aim to capture its flexibility.

Finally, Anand's (2006) diagonalisation operator needs a slight modification in order to make it compatible with my interpretation of what the context and index contain. Instead of overwriting a world co-ordinate, it must now overwrite a set of worlds co-ordinate from the index onto the context. The lexical entry is given below.

(13) $[\![\text{OP } \alpha]\!]^{c,i} = [\![\alpha]\!]^{c',i}$
Where $c' = \langle a*, W, t* \rangle$ for W from i. (adapted from Anand, 2006:110)

4.   Implementation

In this section, I illustrate how my proposal can account for the two crucial facts presented earlier. Firstly, how to account for the speaker-exclusive use of *might* and the lack of such a reading for *must*, as well as the data from Kinyarwanda, which only has speaker-inclusive modals. In addition, I will discuss some predictions that fall out from this proposal for speaker-exclusivity and modals cross-linguistically.

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[7]The use of doxastic in place of epistemic is a personal preference. Nothing significant relies on the distinction for the examples at hand. Readers are welcome to replace *doxastic* with *epistemic* in the rest of the paper if they prefer.

[8]By this I mean that the doxastic alternatives either contain the prejacent or its negation, or entail the prejacent or its negation.

4.1 Speaker exclusivity

Recall the example given for the speaker-exclusive use of *might* and the not-so-secret surprise party. The derivation of truth conditions is given below, and a discussion follows. [Context as in (1). *Why is Ann hiding in the bushes?*]

(14) I might be on that bus

$$= [\![\text{I might be on that bus}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle} \tag{line 1}$$

$$= [\![\text{might}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle} ([\![\text{I be on that bus}]\!])^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle})$$
$$\tag{line 2}$$

$$= \lambda p. \exists w' \in \text{Dox}_{Ann} : [\![p(w')]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle} \tag{line 3}$$
$$([\![\text{I be on that bus}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle})$$

$$= \exists w' \in \text{Dox}_{Ann} : [\![\text{I be on that bus}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle}(w') \tag{line 4}$$

$$= 1 \text{ iff } \exists w' \in \text{Dox}_{Ann} : \text{Bill is on that bus in } w' \tag{line 5}$$

In asking why Ann is hiding in the bushes, Chris makes Ann's motivations based on her knowledge salient. Thus, Dox_{Ann} is added to the index in line 1. Since Dox_{Bill} contains the negation of the embedded proposition, it settles the proposition, hence *might* accommodates in line 3. The modal then quantifies over Ann's doxastic alternatives instead of Bill's due to this accommodation. The resulting condition is true if in some world compatible with Ann's beliefs, Bill is on that bus. This is the desired speaker-exclusive reading for epistemic possibility.

Consider now what would happen if *might* were to be replaced by *must* in the above example. Once again, the derivation is followed by a discussion.

(15) I must be on that bus

$$= [\![\text{I must be on that bus}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle} \tag{line 6}$$

$$= [\![\text{must}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle} ([\![\text{I be on that bus}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle})$$
$$\tag{line 7}$$

$$= \lambda p. \forall w' \in \text{Dox}_{Bill} : [\![p(w')]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle} \tag{line 8}$$
$$([\![\text{I be on that bus}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle})$$

$$= \forall w' \in \text{Dox}_{Bill} : [\![\text{I be on that bus}]\!]^{\langle Bill, \text{Dox}_{Bill}, t* \rangle, \langle e, \text{Dox}_{Ann}, t \rangle}(w') \tag{line 9}$$

$$= 1 \text{ iff } \forall w' \in \text{Dox}_{Bill} : \text{Bill is on that bus in } w' \tag{line 10}$$

In this case, the modal *must* draws from the context and does not accommodate, even if the embedded assertion is settled by the modal base, as we see in line 8. So the modal quantifies over the doxastic alternatives of the speaker, which is in the context. Thus the final line gives us the paraphrase 'In all worlds compatible with Bill's beliefs, Bill is on that bus'. As desired, this is necessarily speaker-inclusive.

Thus this indexical proposal is able to capture the flexibility of the possibility modal in English, as well as the rigidity of the necessity modal.

4.2 Embedding under attitudes

In order to account for points of assessment that diverge from the speaker when a modal is embedded under attitude reports, I proposed that those attitude verbs in English in fact select a monstrous diagonalisation operator which manipulates the context. In this section, I give a small example of how this might work. The verb I use is *think*, which I assume is the identity map, serving only to introduce the operator, and add its agent's doxastic alternatives to the index. The lexical entry for *think* is given below.

(16) $[\![\text{think}]\!]^{c,i} = \lambda p.\lambda x.[\![\text{OP } p]\!]^{c,\langle e,\text{Dox}_x,t\rangle}$

An example of an embedded use of *must* is given below. A discussion follows.

(17) John thinks that must ϕ

$$= [\![\text{thinks}]\!]^{c,i}([\![\text{must } \phi]\!]^{c,i})([\![\text{John}]\!]^{c,i}) \qquad \text{(line 11)}$$

$$= [\![\text{OP must } \phi]\!]^{\langle a*,\text{Dox}_{a*},t*\rangle,\langle e,\text{Dox}_{John},t\rangle} \qquad \text{(line 12)}$$

$$= [\![\text{must } \phi]\!]^{\langle a*,\text{Dox}_{John},t*\rangle,\langle e,\text{Dox}_{John},t\rangle} \qquad \text{(line 13)}$$

$$= 1 \text{ iff } \forall w' \in \text{Dox}_{John} : \phi \text{ is true in } w' \qquad \text{(line 14)}$$

In the above example, ϕ is any proposition that is the prejacent of the modal. In line 11, the attitude verb adds John's doxastic alternatives at the present to the index, and introduces the operator. The operator then proceeds to overwrite the set of worlds in the context with those of the index in line 12, so that the context now contains John's doxastic alternatives. When the necessity modal draws its base from the context in line 13, it finds John's doxastic alternatives, as opposed to those of the speaker. Thus the above statement in (17) is true when for all the worlds doxastically accessible to John at the present, ϕ is true in those worlds.

Thus we see that even though the necessity modal is solely context dependent, the use of a diagonalisation operator allows for the index to play a role in determining the modal base. By partially overwriting the context with the index, we are able to have the modal base consist of worlds that are accessible to the subject of the attitude report instead of the speaker.

4.3 Kinyarwanda and other languages

Now let us account for the data on Kinyarwanda epistemic modals. Recall that unlike in English, in Kinyarwanda, both possibility and necessity modals were speaker-inclusive in unembedded contexts. In order to account for this, we simply need to say that both modals are indexical, and can only draw from the context to form their modal base. Below is a lexical entry for the stem of the possibility modal in Kinyarwanda.

(18) $[\![\text{shobor}]\!]^{c,i} = \lambda p.\exists w' \in \text{Dox}_{a*} : [\![p(w')]\!] = 1$

Note that unlike the entry for the English modal in (11), this entry is not contingent on whether the speaker's beliefs settles the prejacent. It also cannot accommodate to a modal base from the index. This accounts for why an unembedded use of the possibility modal is always speaker-inclusive in Kinyarwanda.

This indexical analysis of speaker-exclusive unembedded epistemic modals makes some interesting predictions for the pattering of epistemic modals cross-linguistically. First, some notation to help explain the following diagrams.

- IN is speaker-inclusive

- EX is speaker-exclusive

- □ denotes the epistemic necessity modal

- ◇ denotes the epistemic possibility modal

- A greyed out box indicates an unavailable reading

I assume that the context is more prominent than the index, and as such is always available to build a modal base upon. This then predicts four possible alignments for epistemic modals in a given language.

(19)

a.
	□	◇
IN		
EX	▒	

b.
	□	◇
IN		
EX	▒	▒

c.
	□	◇
IN		
EX		▒

d.
	□	◇
IN		
EX		

English is represented by (19a) with a speaker exclusive necessity modal, and a shiftable possibility modal, and Kinyarwanda by (19b), where both modals are speaker-inclusive. The other alignments have yet to be found.

5.   Conclusion and next steps

In English, *might* has an unembedded speaker-exclusive reading that is unavailable for *must*. Adopting an index-context split theory, I propose that *might* can retrieve a modal base from the index, while *must* can only do so from the context. In order to account for speaker-exclusivity when embedded under attitude reports, I propose that English attitude verbs select monstrous diagonalisation operators which overwrite the sets of the worlds in the context with those of the index. The indexical analysis of modality has predictions for cross-linguistic alignments of speaker-inclusivity and epistemic modals are at least partially borne out using data from Kinyarwanda.

An indexical analysis of modals opens many potential paths of future inquiry. Two seem the most promising. As mentioned by Nicholas Welch (personal communication, May 19, 2016), it may be possible to subsume reportative evidentials in languages that have it under a similar analysis. At their core, reportative evidentials quantify over the belief state of an individual other than the speaker, and thus could be characterised as obligatorily speaker-exclusive modals. Predictions that an indexical account makes for these elements is a next step along this potential research path. In addition, investigating whether my proposal is compatible with von Fintel & Gillies' (2011) proposal for a contextual account for the speaker-exclusivity of *might* is another path for future inquiry. In their work, von Fintel & Gillies build the modal base out of the distributed knowledge of a contextually salient group of knowers. The flexibility of this approach allows for them to explain speaker-exclusive uses of the possibility modal. The crucial step in blending their account with mine is determining how to ensure that the salient group of knowers for the necessity modal always contains the speaker. Further investigation is required to determine how best to go about this task.

References

Alonso-Ovalle, Luis and Paula Menéndez-Benito. 2010. Modal indefinites. *Natural Language Semantics* 8(1): 1-31.

Anand, Pranav. 2006. De De Se. Doctoral Dissertation, Massachusetts Institute of Technology.

Anand, Pranav and Valentine Hacquard. 2013. Epistemics and attitudes. *Semantics & Pragmatics* 6(8): 1-59.

Egan, Andy, John Hawthorne, and Brian Weatherson. 2005. Epistemic modals in context. In *Contextualism in philosophy*, ed. Gerhard Preyer and Georg Peter, 131-169. Oxford: Oxford University Press.

von Fintel, Kai and Anthony S. Gillies. 2011. 'Might' made right. In *Epistemic modality*, ed. Andy Egan and Brian Weatherson, 108–130. Oxford: Oxford University Press.

Ippolito, Michela. in prep. Epistemics under attitudes | the view from Italian. Paper presented at the University of Toronto SemPrag meeting, Toronto, ON.

Kaplan, David. 1977. Demonstratives . In *Themes from Kaplan*, 1989, Joseph Almog, John Perry, Howard K. Wettstein, and David Kaplan, 481-564. New York: Oxford University Press.

Kratzer, Angelika. (2012). The notional category of modality. In *Modals and conditionals*, Angelika Kratzer, 27-69. Oxford: Oxford University Press.

Schlenker, Philippe. 2003. A plea for monsters. *Linguistics and Philosophy* 26(1): 29-120.

von Stechow, Arnim. 2004. Binding by verbs: Tense, person and mood under attitudes. In *The syntax and semantics of the left periphery*, ed. Horst Lohnstein and Susanne Trissler, 431-488. Berlin: Mouton de Gruyter.

Stephenson, Tamina. 2007. Judge dependence, epistemic modals, and predicates of personal taste. *Linguistics and Philosophy* 30(4), 487-525.