Future Reference and Epistemic Modality in Hindi

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Abstract

This paper presents an analysis of the Hindi morpheme *gaa* that is used in plain-future and epistemic ('presumptive', cf. Sharma 2008) statements. It is argued that *gaa* is a modal, but not a temporal, operator. It is also argued that apparent restrictions on the interpretation of *gaa* are due to independent restrictions on aspectual operators that *gaa* composes with.

1 Introduction

This paper is concerned with the interpretation of the Hindi morpheme *gaa*, which is often referred to as the marker of 'future tense'.[1] *Gaa* is commonly used in plain future assertions. For example, the sentences in (1)[2] can be felicitously uttered if the individuals in question are to arrive two days after the speech time.[3]

(1) a. amitaab^h do din=mẽ aa-e-gaa.
         Amitabh two day=in come-SBJ.3.SG-MOD.M.SG
         'Amitabh will come in two days.'

     b. priti do din=mẽ aa-e-gii.
         Priti two day=in come-SBJ.3.SG-MOD.F.SG
         'Priti will come in two days.'

     c. ve   log   do din=mẽ aa-ẽ-gee.
         DEM.3.PL people two day=in come-SBJ.PL-MOD.M.PL
         'They will come in two days.'

In addition to its use in plain future assertions, *gaa* is also used to make epistemic modal claims that lack future orientation.[4] (2a) is an epistemic modal claim with present temporal orientation. The indicative non-modal counterpart of (2a) is (2b). In (2a) the auxiliary bears subjunctive mood

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[1]As evident in the glosses — and as discussed below — the final vowel of the morpheme changes under agreement with the number and gender of subject of the verb to which it attaches. Some authors use -*g*- as the exponent of this morpheme (e.g., Butt and Lahiri 2013), in order to reflect the variability of the final vowel. In this article I use *gaa*, the masculine singular form, to refer to the morpheme across all of its uses for the sake of convenience.

[2]Abbreviations used are as follows: 1 = first person, 2 = second person, 3 = third person, AUX = auxiliary, CORR = correlative pronoun, DEM = demonstrative, F = feminine, FAM = familiar, IMP = imperative, IMPF= imperfective, M = masculine, MOD = modal, NEG = negation, PFV = perfective, POSS = possessive pronoun, PL = plural, PROG = progressive, PRON = pronoun, PRS = present, PST = past, SG = singular, SBJ = subjunctive.

[3]I have chosen (somewhat tendentiously) to gloss *gaa* as a modal MOD, rather than as a future tense (e.g., FUT), which is more common.

[4]This use is often called the 'presumptive' (see, for example, Sharma 2008).

morphology and the morpheme *gaa*, whereas in (2b) the present indicative auxiliary *hai* 'be' is used. The felicity of the adverbial phrase *ab tak* 'by now' demonstrates the lack of future orientation.

(2) a. ve   log   ab=tak nahı̃ı̄ aa-yee   hõ-∅-gee.
         DEM.3.PL people now=by NEG come-PFV.PL AUX-SBJ.PL-MOD.M.PL

         ≈'They must not have come by now.'[5]

     b. ve   log   nahı̃ı̄ aa-yee   hã̃ı̃.
         DEM.3.PL people NEG come-PFV.PL AUX.PRS.3.PL

         'They haven't come.'

The paper proceeds from the assumption that the *gaa* morphemes in (1) and (2a) are one and the same. Given that assumption, the primary focus of the paper is to offer a univocal analysis of *gaa* that specifies the semantic contribution of the morpheme in both instances. The study is partially informed by previous work on the semantics of English *will*, a morpheme that exhibits similar interpretive variability (i.e. it can be found in both plain future and epistemic utterances — see Jespersen 1924, Hornstein 1990, Enç 1996, Sarkar 1998).

(3) They *will* come in two days.   Plain Future

(4) They *will* not have come by now. ≈ They must not have come by now.   Epistemic

There are a number of possible analyses of *gaa*'s interpretive variability that would provide a univocal semantics of the morpheme, many of which have been explored for English *will*. The first possibility is that *gaa* is simply a future tense.[6] The second possibility is that *gaa* is both a future-shifting temporal and a modal operator. Prior work on English *will* has analyzed the morpheme as a portmanteau that supplies its complement with both a forward-shifted time argument and a quantified world argument (e.g., Abusch 1998, Sarkar 1998, Copley 2002, Condoravdi 2002). It is possible that a similar analysis would be appropriate for *gaa*. The third option is that *gaa* is solely a modal operator. It provides a mechanism to quantify over alternatives, but it has no effect on the temporal interpretation of its complement.

This paper advocates a variant of the third option. I analyze *gaa* as a Kratzerian modal that quantifies over a contextually-determined set of possible worlds. This account aligns itself with the tradition of treating apparent future markers as modals (e.g., Abusch 1998, Copley 2002, Condoravdi 2003, but differs from most previous accounts in one important regard. Despite *gaa*'s association with future orientation, I contend that it is not a tense. Instead, future-shift of *gaa*'s prejacent is contributed by a distinct temporal operator in the scope of the modal: the subjunctive. This analysis goes against a proposal due to Condoravdi (2002) that temporal semantics inhere in all modals, but is consistent with work by Matthewson (2011) that has argued for a separation of temporal and modal semantics in modal future constructions.

Finally, the paper catalogues and attempts to account for restrictions on the interpretation of *gaa*-marked sentences. Because modal flavor and temporal orientation are controlled by independent parameters, the account predicts a wide range of possible readings brought about by different combinations modal flavor, tense, and aspect. The paper explores the space of possible combinations to determine which readings are attested. It is shown that the account appears to over-generate some readings. In each case of over-generation, an attempt is made to explain the absence of the predicted reading on pragmatic or aspectual grounds.

The structure of the paper is as follows. Section 2 serves as a quick primer on relevant aspects of Hindi morpho-syntax and clause structure. Section 3 presents arguments for treating *gaa* as a modal

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[5]Here and elsewhere my glosses commit to the presence of a subjunctive marker on the auxiliary. I represent this marker as ∅ because the marker is not realized as a separate vowel on the auxiliary as it is on main verbs. Despite the lack of the vowel, the presence of subjunctive agreement with the auxiliary can be seen in the nasalization of the preceding vowel with plural subjects.

[6]On this analysis future readings would be trivially derived, while epistemic readings would be arrived at pragmatically (see, e.g., Kissine's 2008 proposal for *will*).

operator. It also takes up the issue of *gaa*'s quantificational strength. Section 4 argues for divorcing forward-shifting temporal semantics from the denotation of *gaa*. Section 5 proposes a denotation for *gaa* and provides derivations of basic readings. Section 6 discusses restrictions on the interpretation of *gaa*-marked sentences and the origin of those restrictions. Section 7 discusses outstanding puzzles.

2   Morphological Preliminaries

Gaa is a morpheme that can attach to different verbal heads. The host verb can be a lexical verb that lacks overt aspectual marking as in (5).

(5)   ve   bacce   do din=mẽ aa-ẽ-gee.
       DEM.3.PL child.M.PL two day=in come-SBJ.PL-MOD.M.PL
       'Those children will come in two days.'

The marker may also appear on an auxiliary verb *ho* when the main verb bears overt aspectual morphology. This is shown with the epistemic reading of *gaa* with present perfect, progressive, and imperfective aspect in (6a-c), respectively. The following sentences could be uttered in instances where I intend to make a statement about an event that I presume to have happened or one that I presume to be ongoing.

(6)   a.   ve   log   abʰi=tak pahũcʰ-ee   hõ-∅-gee.
            DEM.3.PL people now=by   arrive-PFV.PL AUX-SBJ.PL-MOD.M.PL
            'They must have arrived by now.'
       b.   ve   log   abʰi naac rah-ee   hõ-∅-gee.
            DEM.3.PL people now dance PROG-M.PL AUX-SBJ.PL-MOD.M.PL
            'They must be dancing now.'
       c.   ve   log   yahãã aksar aa-tee   hõ-∅-gee.
            DEM.3.PL people here   often come-IMPF.M.PL AUX-SBJ.PL-MOD.M.PL
            'They must come here often.'

Gaa can also attach to the auxiliary in copular constructions.

(7)   ve   bacce   do saal=mẽ lambee   hõ-∅-gee.
       DEM.3.PL child.M.PL two year=in tall.M.PL be-SBJ.PL-MOD.M.PL
       'Those kids will be tall in two years.'

When *gaa* attaches to a main verb (8a) or auxiliary (8b) in a standard assertion, it must be paired with subjunctive morphology. Subjunctive marking appears between the verb and *gaa* and agrees in person and number with the subject (see Butt and Rizvi 2010, Butt and Ramchand 2005).[7]

(8)   a.   ve   log   caaval banaa-*(ẽ)-gee.
            DEM.3.PL people rice.M make-SBJ.M.PL-MOD.M.PL
            'They will make rice.'
       b.   ve   log   caaval banaa rah-e   hõ-∅-gee./*ho-gee
            DEM.3.PL people rice.M make PROG-M.PL aux-SBJ.PL-MOD.M.PL/aux-MOD.M.PL
   'They will/must be making rice.'

A compositional account of the semantics of *gaa*-marked constructions must determine *gaa*'s position vis-a-vis other morphemes in the clause in order to specify the order in which morphemes compose. A standard Hindi clause can contain, in the following order, a main verb, aspectual marker, auxiliary verb, and tense (agreement) morphology. These morphemes can be seen in the present progressive (9): the main verb *bol* 'speak' precedes the progressive aspectual morpheme *rah-aa*, which in turn precedes an auxiliary that agrees with the main subject in gender and number. The

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[7]Unlike the present and subjunctive markers, *gaa* does not inflect for person, only for number and gender.

auxiliary *hai* is a fusion of the auxiliary *ho* and the suffix *-ai*, which marks 3rd singular present indicative agreement.

(9) amitaab^h bol   rah-aa   hai.
     Amitabh speak PROG-M.SG AUX.PRS.3.SG

     'Amitabh is speaking.'

In accordance with the Mirror Principle (Baker 1985), the ordering of morpheme transparently reflects the commonly assumed underlying hierarchy of morphemes in the verbal domain on the assumption that phrases are head-final in Hindi. The *v*/VP is dominated by AspP (Ferreira 2005, Bhatt and Pancheva 2005), which is itself dominated by Tense. On the assumption that the auxiliary heads its own distinct phrase, it must sit between AspP and TP. Following Bhatt (2005), I assume that Tense (or T^0) is the locus of agreement in the Hindi clause: therefore, any heads or phrases that agree with the controller of agreement in the clause (in this case the subject), must originate in the scope/c-command domain of the local T^0. Taken together, these assumptions yield the structure (10) for (9).[8]
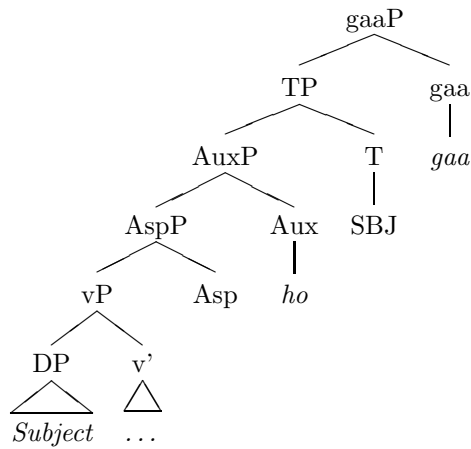
(10)
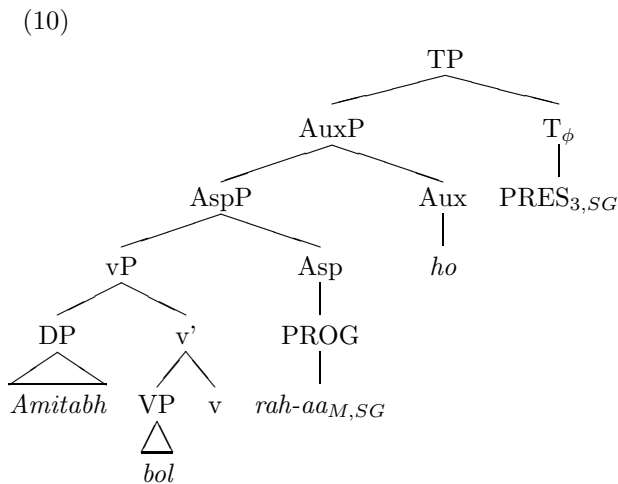
When specifying the structure of a *gaa*-marked clause, we must consider the position of two morphemes not present in (9): the subjunctive and *gaa* itself. The fact that the subjunctive agrees in person and number with the controller of agreement, on par with the present tense in (9), suggests that it should occupy Tense. The position of *gaa* within the clause is slightly more difficult to determine because different considerations point to distinct locations for the morpheme. On the one hand, *gaa* surfaces to the right of the subjunctive morpheme, which might be taken (all else equal) to indicate that the morpheme sits above TP. This interpretation, which hews to a very strict interpretation of the Mirror Principle equating surface linear order with syntactic scope, would provide the structure below for *gaa*-marked clauses.

Placing *gaa* above TP as in (11) would be odd for at least one reason: in (9) *gaa* agrees with the subject of the clause in gender and number, akin to an aspectual suffix. If *gaa* sat above T(P), it would not fall within the typical domain of agreement (again assuming that T is the head responsible for agreement in Hindi). If *gaa* is to agree, it should originate in the scope of T. However, *gaa* cannot be pronounced in this position, otherwise it would surface to the left of the subjunctive morpheme. I assume that if *gaa* originates below T, it head-moves so that it adjoins to the T head. This adjunction causes the morpheme to be spelled out to the right of T (either through direct right-adjunction, or via rules that determine the order of adjoined heads at a post-syntactic stage, see e.g., Embick
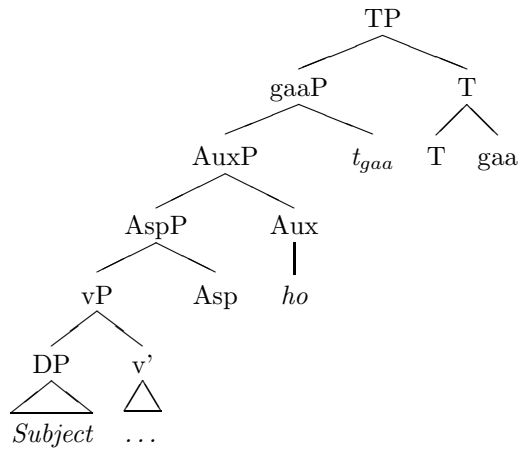
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[8]In the diagrams below, the subject is shown in its interpreted (base) position (spec,*v*P) rather than its raised position in spec,TP. I do not intend this to suggest that the subject does not raise.

(2007).[9]

(11)

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                      gaaP
                    /      \
                  TP        gaa
                /    \        |
            AuxP       T      gaa
           /    \      |
        AspP     Aux   SBJ
       /    \     |
      vP     Asp  ho
     /  \
    DP   v'
    △     △
 Subject  ...
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(12)

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                      TP
                    /    \
                 gaaP      T
                /    \    /  \
            AuxP   t_gaa T    gaa
           /    \
        AspP     Aux
       /    \     |
      vP     Asp  ho
     /  \
    DP   v'
    △     △
 Subject  ...
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[9]One might ask what motivates the dislocation of *gaa*. Why should an affix ever surface to the right of T? The need to move *gaa* to this unusual position may be a diachronic remnant. A number of scholars hold that the present-day *gaa* can be traced back to a participle of the Sanskrit verb *ga* 'to go' (Kellogg 1893, 231, Beg 1988, 191, Butt and Lahiri 2013). Present-day *gaa*-marked constructions may descend from a periphrastic future construction, in which 'go' took a complement clause. Examples of such periphrastic future constructions are relatively common (see Fleischman 1982, Bybee et al. 1994), and can be observed, for example, in present-day Spanish (i) and English (ii).

   (i) Yo voy   a   com-er.
        I   go.1.SG that eat-INF

       'I'm going to eat./I will eat.'

  (ii) I'm going to eat.

Over time, embedding verbs in periphrastic constructions may lose their independent status, becoming incorporated into what was once the embedded clause. Crucially, this process begins at the edge of the clause and moves inward: on their way to becoming true verbal affixes, erstwhile verbs first attach to the periphery of the clause, outside the domain of 'core' verbal morphology, and only later move inward Thus, if *gaa* began as a participle in a 'go' future that had a complement clause to its left, it would naturally cliticize to the right edge of the original clause (adjacent to T), as it lost its independence.

Before ending this digression, I note one interesting wrinkle in using a periphrastic 'go' future construction as the diachronic source for *gaa* futures, first remarked upon by Butt and Poudel (2012). In periphrastic futures crosslinguistically 'go' typically embeds non-finite complements. If subjunctive morphology is considered a kind of tense marking, the proposed source of the *gaa*-future would appear to violate a cross-linguistic norm.

For the purposes of this paper, I adopt the assumption that *gaa* does, in fact, originate below T, so that agreement is straightforwardly explained. I also assume that this head movement or dislocation does not have any interpretive consequences (Chomsky 2001); in all subsequent derivations, *gaa* is assumed to compose below T.[10]

3 Motivating Modality

Gaa is commonly glossed as a future tense, which suggests that the null hypothesis is that it is a simple tense operator, on par with the present or past tense. To argue against this simplistic view, I present two pieces of evidence that *gaa* exhibits properties of a modal operator. The first argument is morphological: *gaa* must obligatorily be used with subjunctive mood morphology, which arguably only appears in modal contexts (Portner 1998). The second argument in favor of analyzing *gaa* as a modal comes from the fact that appears to quantify over a domain of possibilities, as evidenced by its ability to license conditionals and participate in modal subordination. In this regard, *gaa* exhibits the behavior of other modal operators and contrasts simple tenses, which do not enable quantification over alternative states of affairs.

Gaa requires that its verb bear subjunctive marking. As in many Indo-European languages, the Hindi subjunctive appears in a limited variety of environments. The subjunctive primarily occurs in 'embedded' environments such as in: (i) the complement position of a bouletic verb (13); (ii) the antecedent of a conditional (14).[11]

(13) a. vo   caah-taa   hai   ki   mãĩ   ja-ũũ.
        PRON.3.SG want-IMPF.M.SG AUX.PRS.3.SG that PRON.1.SG go-SBJ.1.SG
        'He wants me to go.' lit. 'He wants that I go.'

     b. umiid hai   ki   vo   tʰiik ho jaa-e
        hope AUX.PRS.3.SG that PRON.3.SG okay be go-SBJ.3.SG
        '(I) hope it gets better.' lit. 'Hope is that it gets better.'

(14) a. agar ve   log   duudʰ pi   rah-e   hẽ-∅,   to   un=ko
        if   DEM.3.PL people milk   drink PROG.PL AUX-SBJ.3.PL then PRON.OBL=ACC
        pareʃan mat kar-na.
        bother NEG do-INF.M.SG
        'If they're drinking milk, then don't bother them.'

     b. agar us=ne   duudʰ pi-yaa   ho-∅   to
        if   PRON.OBL.3.SG=ERG milk   drink-PFV.M.SG AUX-SBJ.3.SG then
        us=ko   pasifaiyer de-na.
        PRON.OBL.3.SG=DAT pacifier   give-INF.M.SG
        'If he's drunk milk, give him the pacifier.'

The environments above can both be seen as containing a modal operator that scopes over the subjunctive (Portner 1998).

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[10]See section 7 for some discussion that considers whether *gaa* is actually interpreted above T, as in (11).

[11]The morpheme can be added to the polite imperative (i) to produce (ii). An anonymous reviewer notes that the use of *gaa* in this construction is compatible with the generalization that *gaa* requires the subjunctive under the assumption that the ending *-iye* is an archaic subjunctive form.

  i. abʰi caaval banaa-iye
    now rice.M make-IMP.POLITE
    'Please make rice now.'

 ii (#abʰi) caaval banaa-iye-gaa
    now   rice.M make-IMP.POLITE-MOD.M.SG
    'Please make rice (at some later point).' #'Please make rice now.'

(15)   a.   Complement clause of a bouletic
want/hope that X...≈
In all worlds consistent with speaker's desires/hopes that X . . .

        b.   Antecedent of a conditional
If X . . .≈
In all worlds in which X holds . . .

In matrix environments, the distribution of the subjunctive is even more limited, but its presence is still conditioned by a modal. Matrix subjunctive is only licensed when there is an overt modal operator like *ʃaayad* 'maybe', or in deontic questions and in bouletic exhortations, two environments where a covert modal is present (Portner 1998).

(16)   ʃaayad mãĩ   kal   kaam   kar-ũũ.
maybe PRON.1.SG tomorrow work.M do-SBJ.1.SG

'Maybe I will work tomorrow.'[12]

(17)   mãĩ   kaam   kar-ũũ?
PRON.1.SG work.M do-SBJ.1.SG

'Shall I work?'

(18)   amitaabʰ zinda rah-e!
Amitabh alive stay-SBJ.1.SG

≈ 'Long live Amitabh!'

The subjunctive cannot typically be used in isolation to make plain declarative statements (19a). However, once *gaa* is added, a simple declarative is possible (19b).

(19)   a.   mãĩ   kal   kaam   kar-ũũ.
PRON.1.SG tomorrow work.M do-SBJ.1.SG

          #'I will work tomorrow.'

        b.   mãĩ   kal   kaam   kar-ũũ-gaa.
PRON.1.SG tomorrow work.M do-SBJ.1.SG-MOD.M.SG

          'I will work tomorrow.'

If the subjunctive requires a licensing modal then one must be present in (19b). The simplest assumption seems to be that *gaa* acts as the modal licensing the subjunctive.[13]

Gaa exhibits another characteristic behavior of a modal operator: its use seems dependent on a domain of quantification (e.g., a set of possible worlds). In this regard it contrasts with plain tenses which do not quantify over worlds. One way of showing that *gaa* has a domain of quantification is to observe how it interacts with conditional operators. According to one line of reasoning, conditional operators function to restrict a modal's domain of quantification (see Kratzer 1986, von Fintel 1994). Thus, if an item licenses the use of a conditional, it must be a modal.

The restrictive role that conditionals play is intuitively demonstrated with English *must*. In the sentence below, the modal claim is only evaluated with respect to the worlds (or situations) where there are mangoes on the table. The sentence can be interpreted in one of two ways. It can be taken as a statement of epistemic inference, or of obligation.

(20)   If there are mangoes on the table, Amitabh must eat mangoes.

        a.   ≈ The presence of mangoes on the table indicates that Amitabh is a mango-eater.
        b.   ≈ The presence of mangoes on the table should cause Amitabh to eat mangoes.

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[12]This and other examples gloss the frame adverbial *kal* as 'tomorrow' for the sake of simplicity. This is strictly speaking inaccurate because *kal* can mean either 'tomorrow' or 'yesterday' depending on context.

[13]I return to the syntax of subjunctive licensing in Section 7.

The sentence above shows that conditionals are licensed in the presence of *must*, which is analyzed as a modal. However, in order to motivate the use of conditionals as a diagnostic for modality, we must show that conditionals are not licensed with simple non-modal sentences. There is one small complication that bedevils our ability to do so: it appears that conditionals are sometimes licensed when no overt modal is present. For example, (21) is acceptable, but there is not a modal in sight.

(21)   If Amitabh is quiet, he is angry.

(21) might seem to suggest that we cannot use the acceptability of a conditional to diagnose the presence of a modal. However, as Copley (2002) and Klecha (2014) have argued, this conclusion would be wrong. According to these authors, the interpretation of sentences such as (21) is limited in a way that attenuates the threat that they pose to the generalization that conditionals depend on modal licensors. The authors suggest that the conditional in (21) is, in fact, licensed by a modal, albeit a covert one. They note that in (21) and sentences like it, the antecedent cannot stand in a causation relation to the consequent: The meaning of (21) cannot be paraphrased as the causal (22a). Instead, an *indicational* inference must link the content of the two clauses. A suitable inferential paraphrase of is given in (22b).

(22)   a.   #Amitabh's quietude *causes* his being angry.
       b.   Amitabh's quietude implies/indicates that he is angry.

They argue that the inferential readings are tantamount to analyzing the original sentence as containing a covert epistemic modal in the consequent. This modal is responsible for licensing the conditional.

(23)   If Amitabh is quiet, he *must* be angry.

Conditional sentences that contain an overt modal are not limited to inferential readings. A causal link can be established, for example, between the two clauses in (24). *Must* expresses modal obligation, which allows a causal paraphrase.

(24)   If Amitabh is naughty, he must stand in the corner.
       ≈ Amitabh's naughtiness causes him to have to stand in the corner.

According to this diagnostic, then, the acceptability of a conditional can be used to infer the presence of an overt modal if the conditional can be given a causal reading. Inferential or epistemic readings of a conditional cannot be used to argue for the presence of an overt modal because these readings could, in principle, be achieved through a covert modal. Therefore, returning to examples like (20), the epistemic reading (20a) does not necessarily motivate the modality of *must*. It is the possibility of the causal reading (20b) and (24) that motivates analyzing *must* as a modal.

How does this influence our assessment of the modality of *gaa* in Hindi? First, we must determine if the distribution of indicational and causal readings is the same in Hindi as it is in English. The answer appears to be yes. In (25) there is is no overt modal; the consequent of the conditional contains a verb that bears perfective aspect and no other marking. There are no other operators in the clause.

(25)   agar vo   kʰush tʰ-aa,   us=ne   kʰaa-yaa.
       if   PRON.3.SG happy be-PST.M.SG, PRON.OBL.3.SG=ERG eat-PFV.M.SG
       'If he was happy, he ate.'

The possible paraphrases of (25) track those of (21). (25) cannot mean the causal (26a), only the inferential (26b).

(26)   a.   #Amitabh's happiness *caused* his eating.
       b.   Amitabh's happiness implies/indicates that he ate.

It would seem that the ability to support causal readings of a conditional is an appropriate test for the presence of an overt modal in Hindi, just as in English. We can turn to using the test to probe *gaa*'s modal properties.

(27), the Hindi counterpart of (20), can receive an epistemic reading. On this reading, the conditional is unsurprisingly felicitous. This is consistent with *gaa* being a modal, but it could also indicate the presence of a covert modal. Unfortunately, (27) cannot receive a causal reading, so the acceptability of the conditional may not be very informative.

(27) agar aam   mez=par rakʰ-e   hãĩ,   amitaabʰ aam   kʰaa-taa
     if   mango.M table=on set-PPL.M.PL AUX.PST.3.PL, Amitabh mango.M eat-IMPF.M.SG
     ho-∅-gaa.
     AUX-SBJ.3.SG-MOD.M.SG

     'If there are mangoes on the table, Amitabh must eat mangoes.'
     ≈ The presence of mangoes on the table indicates that Amitabh eats mangoes.
     # The presence of mangoes on the table should cause Amitabh to eat mangoes.

Although the causal readings cannot be found in (27), a causal reading of a conditional is possible with future-oriented *gaa*. In (28), where the verb in the consequent of the conditional is *gaa*-marked, Amitabh's future sadness is causally linked to his past quietude. We can conclude that this causal inference is supported by the presence of *gaa* because the same causal link cannot be established between an antecedent and a past-marked consequent (29).

(28) agar amitaabʰ cup-caap rah-e,   vo   dukʰii ho-∅-gaa.
     if   Amitabh quiet   remain-SBJ.3.SG, PRON.3.SG sad   be-SBJ.3.SG-MOD.M.SG

     'If Amitabh remains quiet, he will be sad.'
     ≈ Amitabh's quietude causes future sadness.

(29) agar amitaabʰ cup-caap rah-aa,   vo dukʰii tʰ-aa.
     if   Amitabh quiet   remain-PFV.M.SG, he sad   be-PST.M.SG

     'If Amitabh remained quiet, he was sad.'
     ≈ If Amitabh was quiet, he must have been sad.
     ≢ Amitabh's quietude cause his sadness.

Thus, we have our first piece of evidence in favor of analyzing *gaa* as a modal.

Another test for modality that relies on conditionals to restrict the domain of a modal can be used for future *gaa*. Some modals can undergo a kind of subordination that yields *Implicit Conditional* readings (Klecha 2009, Roberts 1989). (30a) shows that the modal *might* supports an implicit conditional reading; (30b) shows *gaa* permits similar subordination.

(30) a. Don't touch it! It might explode (if you do)!
     b. us=ko   mat cuu-na!   vo   ṭuuṭ ja-e-gaa   (agar
          that.OBL=ACC NEG touch-INF.M.SG! PRON.3.SG break go-SBJ.3.SG-MOD.M.SG (if
          tum aisa kar-o-ge).
          you that do-SBJ.2.PL-MOD.M.PL)
          'Don't touch that. It'll break (if you do).'

Simple tenses cannot undergo similar subordination. Consider the availability of an implicit conditional reading in (31a) and the absence of the corresponding subordinated reading with the simple past tense (31b).[14] The same asymmetry is observed between *gaa*-marked clauses (31c) and perfective-marked clauses (31d).

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[14]These sentences are adapted from examples in Klecha (2009).

(31)   a.   If she goes to New York, she'll go to the wedding. She might enjoy herself (if she does).
    b.   If she went to New York, she went to the wedding. #She enjoyed herself (if she did).
    c.   agar vo   nu york jaa-e-gii,   to   vo   ʃaadi=mẽ
        if   PRON.3.SG New York go-SBJ.3.SG-MOD.F.SG, then PRON.3.SG wedding=in
        jaa-e-gii.   us=ko   mazaa   aa-e-gaa.
        go-SBJ.3.SG-MOD.F.SG. PRON.OBL.3.SG=DAT enjoyment come-SBJ.3.SG-MOD.M.SG
        'If she goes to New York, she'll go to the wedding. She will enjoy it.'
    d.   agar vo   nu york ga-yii,   to   vo   ʃaadi=mẽ ga-yii.
        if   PRON.3.SG New York go-PFV.F.SG, then PRON.3.SG wedding=in go-PFV.3.F.SG
        #us=ko   mazaa   aa-yaa.
        PRON.OBL.3.SG=DAT enjoyment come-PFV-M.SG
        'If she went to New York, she went to the wedding. #She enjoyed it.'

In sum, its obligatory co-occurrence with the subjunctive and the readings it licenses with conditionals suggest that *gaa* is a modal.

3.1   Domain of Quantification

Following Kratzer (1977, 1991) I formalize a modal's domain of quantification using a modal base (MB), which provides a set of possible worlds over which the modal quantifies. MBs differ with respect to the accessibility relation that restricts the subset of quantified possible worlds. Kratzer (1977, 1991) identified two MBs that are relevant to our purposes: (i) the epistemic MB and (ii) the circumstantial MB. An epistemic modal base is the set of worlds that are consistent with some body of evidence available to the speaker, or the speaker's beliefs, at the evaluation time of the modal. The circumstantial, on the other hand, is the set of worlds compatible with (objective) facts or circumstances in the evaluation world (w) at a given time (t).

(32) $MB_{Epistemic}$(w,t) ={w': w' is a world consistent with a body of evidence/beliefs in w at t}

(33) $MB_{Circumstantial}$(w,t) ={w': w' is a world consistent with a relevant set of facts/circumstances in w at t}

Modal operators can be lexically underspecified for their domain of quantification. They can rely on the context to set that parameter. This underspecification has been used to account for the fact that the same modal can contribute different readings depending on its context of use (Kratzer 1977). For example, *must* receives a different interpretation in (30a,b) depending on the worlds it quantifies over. The differences in the set of worlds chosen in the sentences can be brought out by the addition of the conditional clauses.

(34)   a.   John *must* exercise (if he wants to lose weight).
    b.   John *must* be exercising now (according to his schedule).

The first *must*, which expresses a kind of teleological claim, makes use of the circumstantial MB. In order to achieve the goal of losing weight, the circumstances of the world dictate that John must exercise. The second claim is epistemic. The utterer is making the claim that it is consistent with her evidence (John's schedule) that he is currently working out.

In the same way that *must*'s interpretive variability can be attributed to differences in MB, I propose that the two readings of *gaa* exemplified in (1) and (2) come about as a result of keying the modal to the circumstantial and epistemic MB. Plain future readings come about when *gaa* quantifies over worlds that are circumstantially accessible (as proposed for other future markers by Copley 2002, Abusch 2007, Matthewson 2006, a.o.). For example, sentence (1), reprinted below, can be roughly paraphrased as a claim about worlds in the circumstantial MB.

(1) ve   log   do din=mẽ aa-ẽ-gee.
    DEM.3.PL people two day=in come-SBJ.3.SG-MOD.3.PL
    'They will come in two days.'
    PARAPHRASE:
    The people arrive two days after the present in the worlds that are consistent with the circumstances in the actual world.

Epistemic readings arise when the modal takes the epistemic MB. Speakers make a claim about worlds that are consistent with their current evidence. (2a) would receive the paraphrase:

(2a) ve   log   ab=tak nahĩĩ aa-yee   hõ-∅-gee.
    DEM.3.PL people now=by NEG come-PFV.PL AUX-SBJ.PL-MOD.M.PL
    'They must not have come by now.'
    PARAPHRASE:
    The people's arrival did not occur at any point prior to the present in the worlds that are consistent with what is known/the evidence at the time of speech.

One might wonder why it is necessary to distinguish between the two MBs at all. For example why do we need to invoke the circumstantial modal base for plain future readings? Why not use the epistemic modal base for all readings of *gaa*?[15] In some sense all claims about the future are predictions, based on the set of facts at the speaker's disposal at utterance time. Speakers do not, in actuality, have direct knowledge of future events in the way they can of past and present events. Nor do they have access to an objective set of facts about the state of the world separate from their own beliefs. Given the objective uncertainty about the future, cautious language users would only be within their rights to make epistemic predictions about future events.

The question of whether speakers are ultimately justified in making definitive claims about the future is more the province of epistomology than language use. Yet, it appears that speakers do, in practice, distinguish between epistemic modal claims and plain future claims. Some evidence comes from the distribution of possible readings. If all future claims were simply epistemic modal claims, we would expect the distribution of future claims to be subject to the same constraints that govern the distribution of epistemic modals. Epistemic readings of *gaa* are not available under the propositional attitude verb *know* (35). Suppose that it is common knowledge that Amitabh is a big meat eater. Reporting this fact using an epistemic modal would be infelicitous. This is presumably because epistemic *gaa* carries with it some kind of indirect evidential semantics (see von Fintel and Gillies 2010 for discussion of evidential semantics of epistemic modals). Use of epistemic *gaa* implies some inference. In cases where a proposition is general knowledge, no inference is required.

(35) #sab log   jaan-tee   hãĩ   ki   amitaabʰ mãs kʰaa-taa
    all   people know-IMPF.M.PL AUX.PRS.3.SG that Amitabh meat eat-IMPF.M.SG
    ho-∅-gaa.
    AUX-SBJ.M.SG-MOD.M.SG
    #'Everyone knows that Amitabh must eat meat.'

If all future claims were epistemic claims, we would expect future reference to be impossible under *know*, contrary to fact. Suppose Amitabh states in a press conference that he plans to eat meat at an upcoming gala. It would be felicitous to state (36).

(36) sab log   jaan-tee   hãĩ   ki   amitaabʰ mãs kʰaa-e-gaa.
    all people know-IMPF.M.PL AUX.PRS.3.SG that Amitabh meat eat-SBJ.M.SG-MOD.M.SG
    'Everyone knows that Amitabh will eat meat.'

If we associate evidential semantics with the epistemic MB, it would appear that future *gaa* is not an epistemic modal. A separate MB is required — the circumstantial.

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[15]Such a proposal was put forward by Crouch (1993) for English *will*.

In addition to a modal base, Kratzer (1981) also argued that the meanings of modals are assessed relative to a second conversational background that provides an *ordering source* (OS) by which worlds in the base are ranked. Ordering sources are used to account for the range of interpretations associated with circumstantial (root) modals. For example, the modals below are analyzed by Kratzer as circumstantial modals, but they all take different ordering sources. Deontic modals result from pairing the circumstantial MB with a deontic ordering source. The modal *can* in (37a) is an example of this. A dispositional ordering source accounts for the ability reading of (37b), whereas a teleological ordering is required for (37c).

(37) a. John can work out here. (I give him permission.)
      b. John can lift 500 lbs (in view of his monstrous lats).
      c. John should/must exercise more (to get sculpted triceps).

The ordering sources above do not exhaust the list of possible ranking functions. Among others, a *stereotypical* ordering source was also hypothesized to exist, which ranks worlds according to how 'normal' they are. The OS is typically thought to be paired with the epistemic MB to ensure that only the most plausible, normal epistemic possibilities are considered.

The stereotypical OS can also be used with future circumstantial modals (Copley 2002, Matthewson 2006, Werner 2006, a.o.), in order to ensure that possible futures are only those that conform with plausible continuations of current states of affairs.

Apart from the stereotypical, circumstantial *gaa*'s repertoire of ordering sources contains the dispositional OS (38) and bouletic OS (39). In (38) the worlds in the circumstantial MB are ordered according to whether Amitabh acts according to his disposition to eat cake. In (39), the worlds in the MB are ranked according to whether Amitabh achieves his desire of obtaining a cake to eat.[16]

(38) kyũũki amitaab^h kek bahut pasand kar-taa   hai,   vo   koi-b^hi kek
      because Amitabh cake much like   do-IMPF.M.SG AUX.PRS.3.SG, PRON.3.SG any   cake
      pyaar=se k^haa le-∅-gaa.
      love=with eat   take-SBJ.M.SG-MOD.M.SG

      'Because Amitabh likes cake a lot, he'll gladly eat any cake you give him.'

(39) kyũũki amitaab^h kek k^haa-naa   cahaa-taa   hai,   vo   kek
      because Amitabh cake eat-INF.M.SG want-IMPF.M.SG AUX.PRS.3.SG, PRON.3.SG cake
      k^harid-e-gaa.
      buy-SBJ.M.SG-MOD.M.SG

      'Amitabh will buy cake because he wants to eat cake.'

Gaa-marked constructions do not exhibit other readings that circumstantial modals take. The morpheme cannot be used to express deontic obligation. For instance, in (40) *gaa* cannot be paired with imperfective morphology to express regular obligation. Similarly *gaa* cannot be used to talk of obligations in the future (41). Nor can *gaa* be used teleologically. A translation of (37c) using *gaa* is not possible (42).[17] These readings are presumably blocked by lexical restriction.

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[16]Thanks to an anonymous reviewer for pointing this reading out.

[17]An anonymous reviewer notes that *gaa* may appear in some constructions that express deontic obligation. For example, in the sentence below, the *gaa*-marked auxiliary composes with an infinitival and an oblique subject to make a statement about Amitabh's deontic obligation to clean his room. This statement could be read as expressing a future obligation or a presumed obligation at present.

    i. amitaab^h=ko apn-aa   kamraa saaf karnaa   ho-∅-gaa.
        Amitabh=DAT self's-M.SG room   clean do.INF.M.SG AUX-SBJ.M.SG-MOD.M.SG

        'Amitabh will/must have to clean his room.'

In spite of *gaa*'s presence, the deontic modality expressed by these sentences is independent of *gaa*. Instead, it is likely contributed by the infinitival (or via some constructional combination of the infinitival and the dative-marked subject, as suggested by Butt and King 2004). The same configuration expresses deontic modality when *gaa* is absent (for example, with a present indicative, instead of a *gaa*-marked auxiliary).

(40) amitaabʰ roz   apnaa   kamraa saaf kar-taa   ho-∅-gaa.
      Amitabh daily self's-M.SG room   clean do-IMPF.M.SG AUX-SBJ.M.SG-MOD.M.SG

      '#Amitabh has to clean his room daily.'

(41) amitaabʰ apnaa   kamraa saaf   kar-e-gaa.
      Amitabh self's-M.SG room   clean do-SBJ.M.SG-MOD.M.SG

      #Amitabh will have to clean his room.'

(42) majbuut ban-ne=ke   liye, jan   vyaayaam kar-e-gaa.
      Strong   become-INF.OBL=GEN.OBL for, John exercise do-SBJ.M.SG-MOD.M.SG

      #'To get strong, John should/must work out.'
      'To get strong, John will work out.'

To sum up this subsection, we have seen that *gaa* can take either an epistemic or circumstantial MB. The use of two MBs was motivated intuitively by the need to account for two kinds of readings (plain future and epistemic uses), as well as by distributional evidence: plain future readings are not subject to restrictions on epistemic *gaa*. It was also argued, based on *gaa*'s inability to license the full range of root modal readings, that *gaa*'s ordering source parameter is lexically restricted to the stereotypical, dispositional, or bouletic OS.

3.2 Modal Strength

Modals can vary in quantificational strength, or force. On the traditional Kratzerian analysis, the strength of a modal is lexically fixed, in contrast to the MB or OS parameter. A modal can either be a *possibility* modal which quantifies over its domain of possible worlds existentially, or a *necessity* modal, which is a universal quantifier (see Kratzer 1977, among many others). An example of the former is *might*, the latter is *must*.

(43) John might play ball.
      There exists some world provided by the MB in which John plays ball.

(44) John must play ball.
      In every world provided by the MB John plays ball.

Prior glosses have made use of the English 'must' to translate the contribution of epistemic *gaa*, suggesting that *gaa* has universal force. Supposing universal force for *gaa* would also be consistent with prior work on future markers like English *will*, which are frequently analyzed as universal quantifiers over possible worlds (cf. Condoravdi 2002, Copley 2002, Sarkar 1998, a.o.). Moreover, this analysis comports with the basic facts. The *gaa* morpheme does, in many respects, display behavior consistent with universal force.

One test of a modal's strength involves how it interacts with conjunction. A claim of possibility ($\Diamond\phi$) can be conjoined with the possibility of its negation ($\Diamond\neg\phi$) without contradiction arising. On the other hand, conjoining the universal $\Box\phi$ with $\Box\neg\phi$ does result in a contradiction. This explains the acceptability of (46a), which uses the existential modal *might*, and the unacceptability of (46b), which uses the universal modal *must*.

(45) a. ✓ $\Diamond\phi \wedge \Diamond\neg\phi$ (No Contradiction)
      b. # $\Box\phi \wedge \Box\neg\phi$ (Contradiction)

(46) a. John might come and John might not come.
      b. # John must come and John must not come.

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ii. amitaabʰ=ko apn-aa   kamraa saaf kar-naa   hai.
    Amitabh=DAT self's-M.SG room   clean do-INF.M.SG AUX.PRS.3.SG

    'Amitabh has to clean his room.'

Gaa-marked epistemic claims behave like *must* under conjunction. A scenario illustrates: Suppose my friend and I are planning a party and want to know what we should serve our guests. My friend asks whether the people we've invited eat mangoes. If I want to express that I consider it a possibility that they might or might not eat mangoes, I cannot utter (47).[18]

(47) #ve   log   aam   kʰaa-tee   hõ-∅-gee   aur ve   log
      DEM.3.PL people mango.M eat-IMPF.M.PL AUX-SBJ.3.PL-MOD.M.PL and DEM.3.PL people

      aam   nahĩĩ kʰaa-tee   hõ-∅-gee.
      mango.M NEG   eat-IMPF.PL AUX-SBJ.PL-MOD.M.PL

      #'They must eat mangoes and they must not eat mangoes.'

The same behavior is observed with future *gaa*.

(48) #amitaabʰ kal   aa-e-gaa   aur amitaabʰ kal   nahĩĩ
      Amitabh tomorrow come-SBJ.3.SG-MOD.M.SG and Amitabh tomorrow NEG

      aa-e-gaa.
      come-SBJ.3.SG-MOD.M.SG

      'Amitabh will come tomorrow and won't come tomorrow.'
      (not 'Amitabh might come tomorrow and might not come tomorrow.')

Gaa also behaves like an obligatorily strong modal in another regard. von Fintel and Gillies (2008, 2010) note that modal claims of the form $\Diamond\phi$ allow a speaker to 'stick to her conversational guns' (i.e. maintain the validity of the modal statement) even after it has been shown that $\neg\phi$. Stated differently, if a speaker utters $\Diamond\phi$ and subsequently finds out that $\neg\phi$, the speaker can claim that she was nevertheless not in error when making the modal claim. If the speaker's original claim was $\Box\phi$, however, then such a conversational move is not possible. We can return to an instance where two friends are having a discussion about mango-eating. Suppose Saif and Amit enter Amitabh's kitchen and find a bag of mangoes that has been neglected on the table. Saif and Amit could have the exchange in (49) and no one could be accused of speaking infelicitously. However, the exchange in (50), where the strong *must* is employed instead of *might*, seems incoherent.[19]

(49)
    Saif: Amitabh might not eat mangoes.
    Amit: You're wrong, I've seen him eat mangoes.
    Saif: Look, I wasn't wrong. I didn't say that he doesn't eat mangoes, I said that he *might* not eat mangoes.

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[18]Curiously, despite its compatibility with strong readings, it is not unheard of for Hindi-speaking informants to offer English translations of *gaa*-marked clauses using the existential *might* instead of *must*. Although some instances appear to be cases of simple translational error, it appears that for some speakers, *gaa* displays the behavior of a weaker quantifier. For example, an anonymous reviewer notes that despite its behavior under conjunction, *gaa* behaves more like a possibility modal under disjunction. Imagine Saif and Amit are standing outside Amitabh's house, knocking on the door. The reviewer maintains that the translation in (ia) more appropriately captures the meaning of the *gaa*-marked construction in (i) than does (ib).

  i. vo   darvaazaa nahĩĩ kʰol rah-aa   hai.   vo   bagiiche=mẽ   ya bathrum=mẽ
      PRON.3.SG door   NEG   open PROG-M.SG AUX.PRS.3.SG PRON.3.SG garden.OBL=in   or bathroom=in

      ho-∅-gaa.
      AUX-SBJ.M.SG-MOD.M.SG

      a. He's not opening the door. He might be in the garden or he might be in the bathroom.
      b. He's not opening the door. He must be in the garden or he must be in the bathroom.

At the moment, I do not have an account of this phenomena, although I make two notes. First, modals under disjunction quite often display behavior that is puzzling from the perspective of well-motivated semantic analysis. Second, the apparent 'weakness' of the claim with respect to an indicative non-modal counterpart may be attributable to the evidential semantics of epistemic constructions and not modal strength *per se*.

[19]Importantly, one or two informants judged the dialogue below to be marginally coherent. When probed further, the informants seemed to be making a meta-linguistic assessment about the difference in form between the modal statement and the present indicative statement.

(50)

Saif:	Amitabh must not eat mangoes.
Amit:	You're wrong, I've seen him eat mangoes.
Saif:	#Look, I wasn't wrong. I didn't say that he doesn't eat mangoes, I said that he *must* not eat mangoes.

If the dialog above is translated into Hindi, the *gaa*-marked verb patterns along the lines of English *must*, rather than *might*.[20]

(51)

Saif: amitaabʰ aam nahı̃ı̃ kʰaa-taa ho-∅-gaa.
     Amitabh mango.M NEG eat-IMPF.M.SG AUX-SBJ.M.SG-MOD.M.SG

     'Amitabh must not eat mangoes.'

Amit: tum=ne galat kah-aa. mã̃ı̃=ne us=ko aam kʰaa-tee
     you=ERG wrong say-PFV.M.SG I=ERG PRON.3.SG.OBL=ACC mango.M eat-IMPF.M.PL

     hu-e dekʰ-aa hai.
     become-PFV.M.PL see-PFV.M.SG AUX.PRS.3.SG

     'You're wrong. I've seen him eat mangoes.'

Saif: #mã̃ı̃=ne galat nahı̃ı̃ kah-aa. mã̃ı̃=ne sirf yeh kah-aa ki vo
     I=ERG wrong NEG say-PFV.M.SG I=ERG only this say-PFV.M.SG that PRON.3.SG

     aam nahı̃ı̃ kʰaa-taa ho-∅-gaa.
     mango.M NEG eat-IMPF.M.SG AUX-SBJ.M.SG-MOD.M.SG

     ≈ 'I wasn't wrong. I only said that he *must* not eat mangoes.'

Finally, *gaa* patterns like a strong modal in downward-entailing (DE) environments such as the scope of negation. A possibility modal in a DE environment yields a stronger claim than a necessity modal in the same environment. For example, although necessity modals are stronger than possibility modals in upward-entailing contexts, in DE contexts this relation is reversed. A negated possibility modal is stronger (i.e. *not possible*) than a negated necessity.

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[20]The same behavior is observed in the absence of negation, as in i..

  i. Saif: amitaabʰ aam kʰaa-taa ho-∅-gaa.
     Amitabh mango.M eat-IMPF.M.SG AUX-SBJ.M.SG-MOD.M.SG

     'Amitabh must eat mangoes.'

  Amit: tum=ne galat kah-aa. us=ko aam pasand nahı̃ı̃ hãı̃.
     you=ERG wrong say-PFV.M.SG PRON.3.SG.OBL=DAT mango.M fond NEG be.PRS.PL

     'You're wrong. He isn't fond mangoes.'

  Saif: #mã̃ı̃=ne galat nahı̃ı̃ kah-aa. mã̃ı̃=ne sirf yeh kah-aa ki vo aam
     I=ERG wrong NEG say-PFV.M.SG I=ERG only this say-PFV.M.SG that PRON.3.SG mango.M

     kʰaa-taa ho-∅-gaa.
     eat-IMPF.M.SG AUX-SBJ.M.SG-MOD.M.SG

     ≈ 'I wasn't wrong. I only said that he *must* not eat mangoes.'

The same facts also obtain in different constructions, such as the copula.

  ii. Saif: amitaabʰ=ko aam pasand hõ-∅-gee.
     Amitabh=DAT mango.M fond b-SBJ.PL-MOD.M.PL

     'Amitabh must be fond of mangoes.'

  Amit: tum=ne galat kah-aa. us=ko aam pasand nahı̃ı̃ hãı̃.
     you=ERG wrong say-PFV.M.SG PRON.3.SG.OBL=DAT mango.M fond NEG be.PRS.3.PL

     'You're wrong. He doesn't like mangoes.'

  Saif: #mã̃ı̃=ne galat nahı̃ı̃ kah-aa. mã̃ı̃=ne sirf yeh kah-aa ki us=ko aam
     I=ERG wrong NEG say-PFV.M.SG I=ERG only this say-PFV.M.SG that PRON.3.SG.OBL=DAT mango.M

     pasand hõ-∅-gee.
     fond be-SBJ.PL-MOD.M.PL

     ≈ 'I wasn't wrong. I only said that he *must* be fond of mangoes.'

(52) $\neg\Diamond >_{strength} \neg\Box$

(53)   a.   It is not the case that John might come.
       b.   It is not the case that John must come, but he might.

(53a) asserts that there is no possibility of John's coming, while (53b) states that it is not necessary (though it remains possible). In the example below, epistemic *gaa* is embedded under a negated propositional attitude verb.[21] In this context, it appears that *gaa* contributes a reading of necessity, rather than possibility.

(54)   [Context: Someone accuses me of having claimed that it was an inescapable fact that the Agarwals live in Washington, DC.]

       a.   mã̃ı=ne nahı̃ı̃ kah-aa   ki   ve   log   DC=mẽ rah-tee
            I=ERG NEG   said-PFV.M.SG that DEM.3.PL people DC=in live-IMPF.M.PL
            hõ-∅-gee.
            AUX-SBJ.PL-MOD.M.PL
            'I didn't say that they must live in DC.'

       b.   mã̃ı soc-taa   hũ̃ũ   ki   ve   ʃaayad VA ya DC=mẽ
            I   think-IMPF.M.SG AUX.PRS.1.SG that PRON.3.PL maybe VA or DC=in
            rah-tee   hã̃ı.
            live-IMPF.M.PL AUX.PRS.3.PL
            'I think that they might live in VA or DC.'

That (54a) can be followed by (54b) shows that a negated epistemic *gaa* follows the pattern $\neg\Box\phi$, which admits $\Diamond\phi$. Thus, epistemic *gaa* once again behaves like a necessity modal.[22]

To summarize this section briefly: It was shown that traditional tests to diagnose modal strength seem to show that *gaa* should be analyzed as a universal modal. I defer providing a denotation for *gaa* that accommodates the notion of force until section 5.

4   Locus of Forward-Shift

The previous section argued that *gaa* cannot be a simple tense, but the arguments did not establish that *gaa* was solely a modal operator. It is conceivable that *gaa* could be both a modal operator and a forward-shifter. There is a tradition, dating back to at least Abusch (1998), of encoding forward-shifting semantics directly into the denotation of particular modals that are used in constructions that make future reference. According to Abusch, English *will* not only quantifies over possible worlds, but also supplies its prejacent with the right-unbounded interval (t, ∞), where t is supplied by a commanding tense. A variant of Abusch's denotation for *woll*, the modal underlying *will*, is below.[23] M represents the set of worlds quantified over, evaluated with respect to the actual world (represented with the indexical w_o).

(55) $[\![woll]\!] = \lambda P\lambda t.\forall w' \in M(w_\mathrm{o})\text{: p(w')}(\mathrm{t},\infty)$

In English, the conflation of modal and tense operators into a single lexical item like *will* does not constitute a marked departure from the general treatment of modals in the language. But one

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[21]Embedding *gaa* in this fashion is necessary because *gaa* outscopes clausemate negation (see, e.g., (2a)).

[22]If one were to provide an account of *gaa* that took into account the fact that some speakers occasionally allow weaker-than-universal readings, one might adopt previous analyses of the apparent context-sensitivity of modal strength in languages like St'atimcets (Rullman et al. 2008), Nez Perce (Deal 2011), or Gitksan (Matthewson 2013) as a guide. These researchers have assumed that modals whose strength appears to depend on the context come lexically specified for strength, which additional mechanisms modulate in context. According to these analyses, a modal with variable force can be analyzed either as a universal quantifier whose meaning is contextually weakened (Rullman et al. 2008), or an existential quantifier whose meaning is pragmatically strengthened in certain contexts (Deal 2011). *Gaa*'s behavior under negation, displayed in (54), would seem to indicate that the former treatment would be more appropriate for *gaa*.

[23]Condoravdi (2002) has argued for extending this treatment. According to her analysis, all modals uniformly shift the time of evaluation forward.

might expect a more hygienic picture in a language that has more clearly demarcated mood, tense and aspect categories, such as Hindi does. I argue that the semantic labor is more evenly divided across different functional morphemes in Hindi than in English. *Gaa* need not act as a forward-shifter because all forward-shift is performed by the subjunctive in *gaa*'s scope. In order to establish this, it must be shown that the subjunctive (i) behaves like a Tense and (ii) makes its own temporal contribution independent of *gaa*.

To begin, note that the subjunctive distributes like a tense: it can attach to auxiliaries in the absence of any other verbal morphology (56a), like the present and past (56b,c).

(56) a. agar ve   log   bimaar hõ-∅,   vo   bimaar ho-∅-gaa.
          if   DEM.3.PL people sick   be-SBJ.PL PRON.3.SG sick   be-SBJ.PL-MOD.M.SG
          '... They are/might be/will be sick.'
      b. ve   log   bimaar hã̃ĩ.
          DEM.3.PL people sick   be.PRS.3.PL
          'They are sick.'
      c. ve   log   bimaar tʰ-ee.
          DEM.3.PL people sick   be.PST-3.PL
          'They were sick.'

Note also that the subjunctive inflects for the person and number of the local subject in clauses without ergative agreement, as does the present Tense. Person and number agreement is seen on the present indicative auxiliary in (57a), and on the subjunctive-marked verb root in (57b).[24]

(57) a. mã̃ĩ bimaar hũ̃ũ.
          I   sick   be.PRS.1.SG
          'I am sick.'
      b. vo caah-taa   hai   ki   mã̃ĩ jaa-ũ̃ũ.
          he want-IMPF.M.SG AUX-PRS.3.SG that I   go-SBJ.1.SG
          'He wants me to go.'

Under the assumption that the subjunctive makes the same temporal semantic contribution across all its uses, its interpretation in contexts where *gaa* is absent can inform our analysis of the interpretation of *gaa*-marked constructions. A subjunctive marked verb can have a present-oriented interpretation (58). In both of the sentences below, the subjunctive-marked predicate of the embedded clause ('eats mangoes') occurs or has occurred at the time of utterance.

(58) a. yeh sambʰav hai   ki   ve   aam   kʰaa-tee
          this possible be.PRS.3.SG that PRON.3.PL mango.M eat-IMPF.M.PL
          hõ-∅-gee.
          AUX-SBJ.PL-MOD.M.PL
          'It is possible that they eat mangoes.'
      b. yeh sambʰav hai   ki   unhõ=ne   ab=tak tiin aam
          this possible be.PRS.3.SG that PRON.3.PL.OBL=ERG now=by three mangoes
          kʰaa-yee   hõ-∅.
          eat-PFV.3.PL AUX-SBJ.PL-MOD.M.PL
          'It is possible that they have eaten three mangoes by now.'

A subjunctive-marked verb can also receive a future-shifted interpretation in the absence of *gaa*. In (59a,b) the embedded predicate is read as occurring at a later point. The eating will be ongoing or will have happened by the day after the utterance time.

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[24]Here, my discussion of the subjunctive and the present as distinct tenses is at odds with certain descriptions in the literature (e.g., Butt and Rizvi 2010 which collapse present and subjunctive into a single tense given the overwhelming similarity in their agreement paradigms).

(59)   a.   yeh sambʰav hai   ki jab tuu   kal   aa-ee,   tab
            this possible be.PRS.3.SG that when you.FAM tomorrow come-SUBJ.2.sg, then

            ve   log   kʰaa rah-e   hõ-∅.
            DEM.3.PL people eat PROG-M.PL AUX-SBJ.PL

            'It is possible that when you come tomorrow they will/may be eating.'

       b.   yeh sambʰav hai   ki jab=tak tu   kal   aa-ee,   tab=tak
            this possible be.PRS.3.SG that when=by you.FAM tomorrow come-SUBJ.2.sg, then=by

            unhõ=ne   tiin aam   kʰaa-yee   hõ-∅.
            PRON.3.PL.OBL=ERG three mango eat-PFV.3.PL AUX-SBJ.PL

            'It is possible that by the time you come tomorrow they will/may have eaten 3 mangoes.'

The data above appear to suggest that future orientation can be achieved through use of the subjunctive in the absence of *gaa*. This could be taken to motivate analyzing the subjunctive as a kind of indefinite present that supplies a rightward open interval encompassing the present and any time thereafter.[25] This analysis would capture the temporal flexibility exhibited by the subjunctive in the preceding examples.

The subjunctive behaves somewhat differently from a simple indexical present. It appears that it can receive back-shifted interpretations under some conditions. Changing the matrix verb in (59) from present to past tense results in a past-reading of the subjunctive-marked complement clause. Similarly, in the when-clause in (61), the subjunctive-marked verb receives an interpretation that overlaps with the past tense of the matrix clause (seen on the auxiliary $t^h aa/t^h ee$).[26] The complement clause of the past-tense *caah* 'want' in (62) receives a reading where the coming event follows the wanting but still occurs prior to the speech time.

(60)   vo sambʰav tʰ-aa   ki ve   log   us   samay kʰaa rah-ee
       it possible be.PST-M.SG that DEM.3.PL people DEM.3.SG time eat PROG-M.PL

       hõ-∅.
       AUX-SBJ.PL

       'It was possible that they were eating at that time.'

(61)   us   zamaane=mẽ,   agar koi garib darvaaze=pe   aa-ee,   tab ham
       DEM.3.SG era.M.SG.OBL=in if   some poor door.M.SG.OBL=on come-SBJ.3.SG, then we

       us=ko   kʰaanaa   de-tee   tʰ-ee.
       PRON.3.SG.OBL=DAT food.M.SG give-IMPF.M.PL AUX.PST-3.PL

       'In those days, if a poor person came to our door, then we would give him food.'

(62)   mãĩ=ne caah-aa   tʰ-aa   ki vo   piccʰle   hafte
       I=ERG want-PFV.PL AUX.PST-M.SG that PRON.3.SG last.M.SG.OBL week.M.SG.OBL

       ja-ee.
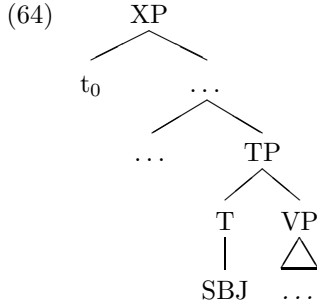   go-SUBJ.3.SG

       'I had wanted him to go last week.'

In all of the above examples, the interpretation of the subjunctive appears back-shifted by a past-tense operator that takes higher scope. This indicates that if we are to analyze the subjunctive as an interval whose right-hand is side open-ended, we must provide a way for the left-hand side of the interval to be bound by a commanding tense. To accommodate these facts I propose the following denotation for the subjunctive.

(63) $\llbracket SBJ_T \rrbracket^{g,c} = \lambda P \lambda t. P(t, \infty)$

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[25]See Butt and Rizvi (2010), Deo (2006), Montaut (2004) for discussion of the subjunctive in Hindi, as well as the diachronic development of the subjunctive from the present form in older Indo-Aryan languages.

[26]Thanks to a reviewer for bringing data point 61 to my attention and requesting further discussion of back-shifted readings of the subjunctive.

Under this analysis, the subjunctive passes the rightward open interval to its complement, licensing a forward-shifted interpretation. The forward-shift begins from t, whose value is supplied by the closest commanding tense. In embedded contexts t will be bound by a present or past tense in a higher clause. In matrix contexts no such tense is available to bind t. I therefore assume an indexical t_0 sits atop matrix TP in order to bind any unbound time variables.

(64)

```
          XP
         /  \
       t_0   . . .
            /    \
         . . .    TP
                 /  \
                T    VP
                |    /\
               SBJ  . . .
```

It is important to note that once we have analyzed the subjunctive as above, there is absolutely no need to suppose that *gaa* has forward-shifting semantics. The fact that the prejacent of *gaa* can be future-oriented can be attributed to the subjunctive in its complement.

5 Denotation of *gaa*

The foregoing sections have established that although it need not have any forward-shifting semantics, the denotation of *gaa* must have:

  i) an underspecified MB parameter

 ii) an underspecified OS parameter

iii) lexical specification for universal force

According to the Kratzerian tradition, the lexical entry of a modal must follow the abstract template:

(65)   MODAL $= \lambda p.$ (Force $w' \in OS(MB(w_0))$:p(w')

The template above says that a modal (minimally) supplies its prejacent proposition (a property of worlds) with a world variable bound by some quantifier (represented as Force w' above). The set of worlds that the modal quantifies over is determined first by the parameter $MB(w_0)$, which stands for the contextually-supplied modal base, evaluated with respect to the real world (w_0). This initial set is passed to the ordering source OS which ranks and further restricts the worlds the modal quantifies over.

The abstract template can be fleshed out for *gaa* in the following manner. The MB parameter remains relatively unchanged, but for the fact that I propose to evaluate the MB with reference not just to a world, but also to a time (e.g., Condoravdi 2002, Hacquard 2010), which I assume to be hardwired as the speech time (the indexical t_0).[27] I make the function that applies the OS to the

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[27]In the denotation the evaluation time is hardwired to t_0. If t_0 rigidly picks out the speech time back-shifted evaluation times of *gaa* embedded under a past tense propositional attitude verb, as in (27), could be considered problematic. This is observed with both epistemic *gaa*.

  i. amitaab^h=ne soc-aa   t^{h}aa   ki   saif aam   pasand kar-taa   ho-∅-gaa,
     Amitabh=ERG think-PFV.3.SG AUX.PST-M.SG that Saif mango.M like   do-IMPF.M.SG AUX-SBJ.3.SG-MOD.M.SG,
     par ab^{h}i vo   jan-taa   hai   ki   yeh galat   t^{h}aa.
     but now PRON.3.SG know-IMPF.M.SG AUX.PRS.3.SG that this wrong be.PST-M.SG

     'Amitabh thought that Saif must eat mangoes, but now he knows that's wrong.'

   These results are not problematic if we adopt the assumption that the interpretation of t_0 in embedded contexts can be set to the internal now of the propositional attitude.

MB more precise by using the BEST_{OS} function from Portner (2009), which further picks out the subset of worlds that conform to the OS's ranking criteria.[28] The resultant denotation is (66).[29]

(66) $[\![gaa]\!]^c = \lambda P\lambda t.\forall \mathrm{w}' \in \mathrm{BEST}_{OS}(MB(\mathrm{w}_0,\mathrm{t}_0))\colon \mathrm{P}(\mathrm{w}')(\mathrm{t})$

With the denotation of *gaa* in hand, we can provide example derivations. Although the denotation provides a number of parameters that are open to contextual variation (i.e. the OS, the MB), for the purposes of illustration, the example derivations below hold the OS fixed as the stereotypical OS (indicated with BEST_{Stereo}), in order to more clearly investigate the space of possible readings created by manipulating the MB and the temporal orientation of the modal's prejacent (provided by the subjunctive).

Consider the derivation of the pair (67a,b), which are structurally identical. Both feature a verb bearing progressive aspect and a *gaa*-marked auxiliary. The two differ in temporal orientation, brought about by use of the future- and present-oriented adverbials *ab* 'now' and *kal* 'tomorrow'.

(67) a. ve   log   kal   kʰaa rah-ee   hõ-∅-gee.
          DEM.3.PL people tomorrow eat   PROG-M.PL AUX-SBJ.PL-MOD.M.PL
          'They will be eating tomorrow.'
      b. ve   log   ab   kʰaa rah-ee   hõ-∅-gee.
          DEM.3.PL people now eat   PROG-M.PL AUX-SBJ.PL-MOD.M.PL
          'They must be eating now.'

To provide a compositional derivation of the truth conditions of these sentences we require a denotation for the progressive operator in addition to the denotation of *gaa*. I assume the denotation below, which makes use of the relation ∘ (Condoravdi 2002), to specify that the run-time of the event ($\tau(e)$) overlaps with the time provided by t. This is intended to capture that the progressive is viewed as contemporaneous with, or ongoing at, the reference time (Comrie 1976).

(68) $[\![PROG]\!] = \lambda P\lambda t.\exists e[\mathrm{P}(e) \;\&\; \tau(e) \circ t]$

Under this analysis (67a) is assigned the structure in (70).[30] Composition proceeds bottom-up as specified in (69).

(69)
a. $[\![vP]\!]^c$ $=$ $\lambda e\lambda w.\ \mathrm{eat}(e,\,\mathrm{they})(w)$
b. $[\![AspP_1]\!]^c$ $=$ $\lambda t\lambda w.\exists e[\mathrm{eat}(e,\,\mathrm{they})(w)\;\&\;\tau(e)\circ t]$
c. $[\![AspP_2]\!]^c$ $=$ $\lambda t\lambda w.\exists e[\mathrm{eat}(e,\,\mathrm{they})(w)\;\&\;\tau(e)\circ t\;\&\;t\bigcap \mathrm{TOMORROW}]^{31}$
d. $[\![gaaP]\!]^c$ $=$ $\lambda t.\forall \mathrm{w}' \in \mathrm{BEST}_{Stereo}(MB(\mathrm{w}_0,\mathrm{t}_0))\colon\exists e[\mathrm{eat}(e,\,\mathrm{they})(\mathrm{w}')\;\&\;\tau(e)\circ t\;\&\;t$ $\bigcap \mathrm{TOMORROW}]$
e. $[\![TP]\!]^c$ $=$ $\lambda t.\forall \mathrm{w}' \in \mathrm{BEST}_{Stereo}(MB(\mathrm{w}_0,\mathrm{t}_0))\colon\exists e[\mathrm{eat}(e,\,\mathrm{they})(\mathrm{w}')\;\&\;\tau(e)\circ (\mathrm{t}_0,\infty)$ $\&\;(\mathrm{t}_0,\infty)\bigcap \mathrm{TOMORROW}]$
f. $[\![(67a)]\!]^c$ $=$ $\forall \mathrm{w}' \in \mathrm{BEST}_{Stereo}(MB(\mathrm{w}_0,\mathrm{t}_0))\colon\exists e[\mathrm{eat}(e,\,\mathrm{they})(\mathrm{w}')\;\&\;\tau(e)\circ \mathrm{TOMOR}\text{-}$ $\mathrm{ROW}]^{32}$

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[28]If one were to attempt to formalize *gaa*'s occasional ability to receive weaker-than-universal interpretations, one could incorporate Rullman and colleagues' approach to analyzing modals as kinds of specific plural indefinites. Under their analysis, a choice function, represented below as f would serve as a final restrictor of the set of worlds that the modal quantifies over. Rullman et al. (2008) abstract away from the OS in their analysis of variable modal strength. It might be possible to incorporate the role of the choice function into the definition of the BEST function, perhaps by allowing context to supply further eligibility criteria to the OS, resulting in a narrower set of worlds.
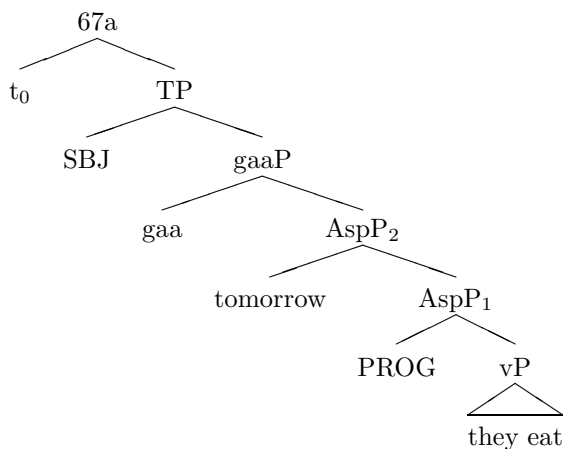
[29]Although it does not influence the temporal interpretation of its prejacent, *gaa* passes its prejacent the lambda-bound t as an argument in (66). This simply a book-keeping measure taken to permit the indexical t_0 to set the left-hand bound of the temporal interval provided by the subjunctive.

[30]I omit the auxiliary for the derivation because I assume it is semantically vacuous.

[31]I assume a simple intersective semantics for frame adverbials such as 'tomorrow' for simplicity: $[\![tomorrow]\!] = \lambda P\lambda t.[\mathrm{P}(t)\;\&\;t\bigcap \mathrm{TOMORROW}]$. See Condoravdi (2002) for a similar denotation.

[32]In this example $\tau(e)\circ (\mathrm{t}_0,\infty)\;\&\;(\mathrm{t}_0,\infty)\bigcap \mathrm{TOMORROW}$ has been reduced to the equivalent $\tau(e)\circ \mathrm{TOMORROW}$.

(70)

```
            67a
          /     \
        t₀       TP
               /    \
            SBJ     gaaP
                   /    \
                 gaa    AspP₂
                       /     \
                  tomorrow   AspP₁
                             /    \
                          PROG    vP
                                 /  \
                                they eat
```
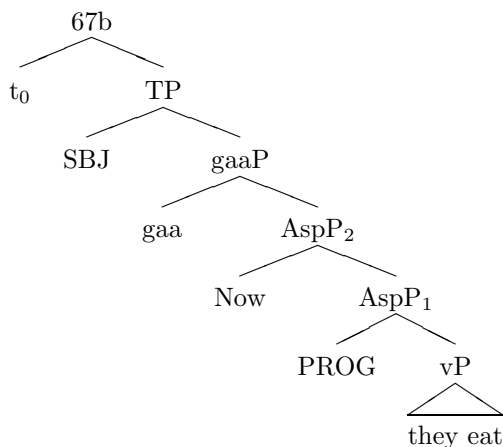
We arrive at the truth conditions in (69f), which state that the run-time of the event overlaps with the reference time. The reference time is the intersection of the temporal interval provided by the subjunctive (t_o, ∞) and the interval specified by the indexical 'tomorrow'. In the truth conditions the MB is still underdetermined. I assume that for future readings the circumstantial MB is the default MB provided by the context c.[33] Choice of the circumstantial MB produces the following truth conditions.

(71) $\forall$w' $\in$ BEST$_{Stereo}(MB_{Circ}$(w$_0$,t$_0$)):$\exists e$[eat(e, they)(w') & τ(e) $\circ$ TOMORROW]

According to this denotation, in all of the worlds that are consistent with the circumstances in the actual world w$_0$ at the present (t$_0$), there is an event of eating that takes place tomorrow of which the people are the agents.

Turning to the derivation of (67b), in which the prejacent of the modal is present-oriented, composition proceeds as in (69) until the adverbial phrase. At this point, the temporal perspective of the prejacent is determined by the intersection of the present-oriented adverb 'now' and the interval (t_o, ∞) provided by he subjunctive.

(72)

```
         67b
        /   \
      t₀     TP
            /   \
          SBJ   gaaP
               /    \
             gaa    AspP₂
                   /     \
                 Now     AspP₁
                        /    \
                     PROG    vP
                            /  \
                           they eat
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[33]See the next section for discussion of other possible readings.

(73)

    a. $[\![AspP_2]\!]^c$ = $\lambda t\lambda w.\exists e[\text{eat}(e, \text{they})(w) \;\&\; \tau(e) \circ t \;\&\; t \bigcap \text{Now}]$

    b. $[\![gaaP]\!]^c$ = $\lambda t.\forall w' \in \text{BEST}_{Stereo}(MB(w_0,t_0)){:}\exists e[\text{eat}(e, \text{they})(w') \;\&\; \tau(e) \circ t \;\&\; t \bigcap \text{Now}]$

    c. $[\![TP]\!]^c$ = $\lambda t.\forall w' \in \text{BEST}_{Stereo}(MB(w_0,t_0)){:}\exists e[\text{eat}(e, \text{they})(w') \;\&\; \tau(e) \circ (t,\infty)\;\&\; (t,\infty) \bigcap \text{Now}]$

    d. $[\![(67b)]\!]^c$ = $\forall w' \in \text{BEST}_{Stereo}(MB(w_0,t_0)){:}\exists e[\text{eat}(e, \text{they})(w') \;\&\; \tau(e) \circ (t_0,\infty)\;\&\; (t_0,\infty) \bigcap \text{Now}]$

                         = $\forall w' \in \text{BEST}_{Stereo}(MB(w_0,t_0)){:}\exists e[\text{eat}(e, \text{they})(w') \;\&\; \tau(e) \circ t_0]^{34}$

Once again, the choice of MB is under-determined by the truth conditions and must be provided by the context. The easiest reading to illustrate is the familiar epistemic reading that arises when the epistemic MB is chosen. According to this reading, as stated in the truth conditions below, the people are eating at the present in all of the best epistemically accessible worlds.

(74) $\forall w' \in \text{BEST}_{Stereo}(MB_{Epist}(w_0,t_0)){:}\exists e[\text{eat}(e, \text{they})(w') \;\&\; \tau(e) \circ t_0]$

The foregoing derivations illustrate how the account derives the default circumstantial future and present epistemic readings of a *gaa*-marked construction. These readings are not the only ones predicted by the account, however. The next section investigates other predicted readings.

6   Possible and Impossible Readings

6.1   Future Epistemics

Although it is commonly assumed that modals for the future take the circumstantial MB as a default (Abusch 2007, Copley 2002, Matthewson 2006), any account that allows the MB to vary independently of the temporal orientation of its prejacent predicts that other MBs may be selected with future orientation. In our case, there is nothing in the account that would bar selection of the epistemic MB for (5), resulting in the truth conditions in (75). The result would be an 'epistemic future' reading (see Condoravdi 2002, Matthewson 2013 for discussion of epistemic futures).

(5) ve   log   kal   kʰaa rah-ee   hõ-∅–gee.
      DEM.3.PL people tomorrow eat   PROG-PL AUX-SBJ.PL-MOD.M.PL
      'They will be eating tomorrow.'

(75) $\forall w' \in \text{BEST}_{Stereo}(MB_{Epist}(w_0,t_0)){:}\exists e[\text{eat}(e, \text{they})(w') \;\&\; \tau(e) \circ \text{TOMORROW}]$

According to these truth conditions, an event is ongoing at the reference time tomorrow in all epistemically accessible worlds. One might wonder how to distinguish epistemic futures from circumstantial futures. Though there may be a considerable amount of overlap between the worlds provided by the circumstantial MB, the set of worlds in the epistemic MB might be generated specifically from some body of evidence or (restricted) body of knowledge. (76) illustrates the ability to make future epistemic claims based on a body of evidence that may not be consistent with the larger set of circumstances.

(76) sabuut=ke hissab=se,   ve   log   kal   aa-ẽ-gee.   par ham
      evidence=of according=from DEM.3.PL people tomorrow come-SBJ.PL-MOD.M.PL but we
      sab jaan-tee   hãĩ   ki   ve   nahĩĩ aa-ẽ-gee.
      all know-IMPF.M.PL AUX.PRS.3.PL that PRON.3.PL NEG come-SBJ.PL-MOD.M.PL
      'According to the evidence, they will come tomorrow. But we all know that they won't.'

If the statements above were both based on the same set of worlds the sentences above would seem as though they were in direct contradiction. However, the felicity of the discourse fragment above suggests that the first claim targets a set of epistemically accessible worlds based on the evidence, whereas the modal in the second sentence quantifies over worlds consistent with the objective facts

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[34]The equivalent $\tau(e) \circ t_0$ has been introduced in place of the more complex $\tau(e) \circ (t_0,\infty) \;\&\; (t_0,\infty) \bigcap \text{Now}$.

at present. Therefore, although both sentences are future-oriented, the first is an epistemic future and the second is a circumstantial future.

6.2   No Present Circumstantials

Because the analysis allows MB and temporal orientation to vary independently of one another, it permits both circumstantial and epistemic readings of *gaa* when the modal's prejacent is future-oriented. Both of these readings are attested. Circumstantial futures accounted for the default interpretation of future-oriented sentences, while epistemic futures could be used to reason about future events based on evidence or beliefs. Prima facie, we would expect the same type of interpretive flexibility with a present-oriented prejacent: *gaa*-marked claims should be interpretable as both present epistemics and present circumstantials. There is ample evidence of present epistemic readings. However, I show below that present circumstantial readings are not attested. Thus, it appears that the account, on its own, overgenerates. However, I propose that this overgeneration is taken care of by an independent pragmatic principle that governs the felicitous use of modal statements: Condoravdi's 2002 *Diversity Condition*.

In order to establish whether a present circumstantial reading is attested, we must be clear about its meaning. The truth conditions corresponding to a present circumstantial reading can be obtained by swapping the MB specification of a present epistemic. This is done below.

(77) $\forall$w' $\in$ $\text{Best}_{Stereo}(MB_{Circ}(\text{w}_0,\text{t}_0))$:$\exists e$[eat(e, they)(w') & τ(e) $\circ$ t$_0$]

The intended meaning can be drawn out if we consider the set of circumstantially accessible worlds that the modal would quantify over. The set would comprise all the worlds that are consistent with the facts/circumstances in the evaluation world at the time of evaluation (in this case, the present). All circumstantially accessible worlds must conform to the circumstances at the present moment, which entails that they are identical to the evaluation world at the present.[35] If ϕ holds at t$_0$ in the evaluation world, ϕ will hold at t$_0$ in all circumstantially accessible worlds. A universal present circumstantial modal statement $M(\phi)$ would therefore quantify over a set of worlds in which ϕ uniformly held at the present. Because the modal would be quantifying over counterparts of the evaluation world (w$_0$), the meaning of a present circumstantial modal claim would be, in principle, the same as its (non-modal) present indicative counterpart. Therefore, if a present circumstantial reading were possible, (67b) reprinted below, should also be able to be read as (78).

(67b) ve   log   ab   k^{h}aa rah-ee   hõ-$\varnothing$-gee.
       DEM.3.PL people now eat PROG-M.PL AUX-SBJ.PL-MOD.M.PL
       'They must be eating now.'

(78)   ve   log   ab   k^{h}aa rah-ee   hã̃ĩ.
       DEM.3.PL people now eat PROG-M.PL AUX.PRS.3.PL
       'They are eating now.'

Contrary to the predictions of the relatively unconstrained theory, native speakers consistently reject such a reading of (67b). In light of this disparity between the predictions of the account and the range of attested meanings, an explanation must be provided. Why are present circumstantial readings unavailable? It is conceivable that one could cast the unavailability of the present circumstantial reading as the result of blocking or economy. The modal statement is 'more complex' than the non-modal statement, so under (semantic) equivalence, the latter should be preferred. Although this account has intuitive appeal, I do not pursue it here.

I follow a proposal due to Condoravdi (2002), which states that a general felicity condition on licit MB-time pairings blocks the present circumstantial reading. I believe this proposal is superior to a blocking explanation because it rules out use of the modal expression without direct reference

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[35]Although they do not differ at the present, they may differ from one another in their future circumstances (see Condoravdi 2002, Matthewson 2013.

or comparison to other forms. The intuition behind Condoravdi's (2002) proposal is that modals can only be used felicitously to talk about live possibilities or alternatives. A proposition ϕ is a 'live' possibility if the conversational context or common ground does not conclusively determine whether ϕ or $\neg\phi$. Take epistemic *must* as an example. In the contexts of two detectives sorting through evidence at a murder scene, it would be felicitous to utter (79). However, it would be infelicitous to utter the same statement after Amitabh had been found guilty of the crime. This infelicity holds even though it is, in point of fact, still consistent with the evidence that Amitabh was the murderer. All that has changed between the two instances is that after the trial Amitabh's guilt is no longer a live issue.

(79) Amitabh must be the murderer.

Condoravdi (2002) formalizes the requirement that modals only discuss live alternatives with the *Diversity Condition* (paraphrased below)[36]. Under the analysis a context c, with common ground cg, can assign a modal base MB to a MODAL with temporal perspective t and applying to property P, only if cg and MB satisfy (80):

(80) DIVERSITY CONDITION
      There is $w \in cg$ and any $w', w'' \in \mathrm{MB}(w,t)$ such that:
      $P(t)(w')$ and $\neg P(t)(w'')$

With this condition, we are in place to explain the absence of the present circumstantial reading of (8). According to Diversity, use of the circumstantial MB with (8) would only be felicitous if the issue of whether the people were eating was live. For the issue to be circumstantially live in the present moment, the following conditions would have to be met:

(i) there must be a circumstantially accessible world in which the people are eating at t_0, and

(ii) there must be a circumstantially accessible world in which the people are not eating at t_0.

Because all circumstantially accessible worlds are identical up to and including t_0, both conditions cannot be met simultaneously. Either all the worlds are those in which the people are eating or they are all worlds in which the people are not eating. Therefore, use of the modal is eschewed in favor of the simple present (78).[37]

6.3 Restrictions on Present Epistemic Readings

Diversity blocks all circumstantial present readings, but allows present epistemic readings. We therefore expect a present epistemic reading wherever present orientation is available. Such readings are attested across a variety of constructions. Present epistemic readings are available with the progressive, imperfective and perfect. A speaker could use each of the sentences below, to make a claim of epistemic certainty about an ongoing event of Amitabh dancing (81), Amitabh's habit of dancing (82), or Amitabh's having danced prior to the speech time (83).

(81) amitaab^h ab   naac rah-aa   ho-∅-gaa.
      Amitabh now dance PROG-M.SG AUX-SBJ.3.SG-MOD.M.SG

      'Amitabh must be dancing now.'

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[36]See a very similar proposal in Werner (2006).

[37]Diversity may also be invoked to explain the lack of other present circumstantial readings cross-linguistically. For example, English *must* can be read circumstantially or epistemically. However, when the complement of the modal is unambiguously present-oriented, a circumstantial reading is not available. For example, a deontic reading is available for i., where the instantiation time of the modal is the future not available for ii.

  i. When I arrive tomorrow, you must be eating!

  ii. You must be eating now!
    # In all the best circumstantially accessible worlds ranked according to a deontic ordering source, you are eating now.

According to Diversity, present circumstantial readings are uniformly blocked. The upshot of this analysis is that all circumstantial modals are, in effect, future-oriented. A similar claim has been made recently by Matthewson (2011).

(82) amitaab^h bahut naac-taa   ho-∅-gaa.
      Amitabh much dance-IMPFV.M.SG AUX-SBJ.3.SG-MOD.M.SG

      'Amitabh must dance a lot.'

(83) amitaab^h ab=tak naac-aa   ho-∅-gaa.
      Amitabh now=by dance-PFV.M.SG AUX-SBJ.3.SG-MOD.M.SG

      'Amitabh must have danced by now.'

Present epistemic reference is also observed with the copula, as shown in the second sentence below.

(84) mã̃ɪ̃=ne amitaab^h=ko   daftar=mẽ nahĩɪ̃ dek^h-aa.   vo   bimaar
      I=ERG   Amitabh=ACC office.M=in NEG see-PFV.M.SG PRON.3.SG sick
      ho-∅-gaa.
      be-SBJ.3.SG-MOD.M.SG

      'I didn't see Amitabh at the office. He must be sick.'

In contrast to the examples above, when *gaa* attaches to a 'bare' main verb, a present epistemic reading is blocked. The sentence below must be interpreted as a claim about a future dancing event.

(85) amitaab^h naac-e-gaa.
      Amitabh dance-SBJ.3.SG-MOD.M.SG

      'Amitabh will dance.' #'Amitabh must dance/must be dancing.'

The principal difference between (85) and the acceptable present epistemic constructions is that (85) lacks the auxiliary *ho*. But it is not immediately obvious what it is about present epistemic readings that makes them incompatible with auxiliary-less constructions. There are three possible avenues of explanation: either (i) epistemic modal flavor requires the auxiliary, (ii) present orientation requires the auxiliary, or (iii) present orientation and epistemic flavor, when conjoined, require the auxiliary.

The first option can be easily dismissed. There is no general incompatibility between epistemic flavor and the absence of an auxiliary. As shown earlier with (76), a *gaa*-marked bare verb can receive epistemic interpretation when it has future orientation. Moreover although (86) is incompatible with a present epistemic reading, it can be read as a future epistemic claim (as evidenced by the adverbial which sets the MB).

(86) sabuut=ke hissab=se,   Amitabh naac-e-gaa.
      evidence=of according=from, Amitabh dance-SBJ.3.SG-MOD.M.SG

      'According to the evidence, Amitabh will dance.'

Of the remaining options, (ii) should be preferred over (iii) on grounds of economy. An explanation that makes reference to temporal orientation alone is simpler than an explanation that posits an interaction of temporal orientation and modality. I contend that such a simple explanation is feasible. Below I provide evidence that present orientation is not possible in the absence of an auxiliary as a general rule. Moreover, I argue that this fact originates in the semantics of Aspect. In Hindi, the absence of an auxiliary entails that the verbal predicate is interpreted as a dynamic eventuality. Following previous authors, I assume that dynamic eventualities are not compatible with present orientation (Kamp and Reyle 1993, Partee 1984, Condoravdi 2002). When an auxiliary is present, on the other hand, the predicate is a (derived) state, which allows present reference.

A predicate's temporal orientation is determined by how aspect relates the run-time of the predicate-denoted event to the reference time set by Tense. If Tense provides an interval, aspect determines whether the run-time either (i) is included in the interval, (ii) overlaps with the interval, or (iii) does not overlap at all (e.g., if the event entirely precedes or follows the interval). Predicates that denote states (such as the progressive), permit temporal overlap (Kamp and Reyle 1993, Partee

1984) with the reference time set by Tense. The test below illustrates the possibility of overlap. When a matrix predicate is stative, it can be interpreted as simultaneous with an event in a modifying *when*-adverbial (Katz 1995).

(87) STATES
      a. When I came home, Amitabh was eating mangoes. (mango-eating overlaps with arrival)
      b. When I came home, Amitabh had eaten mangoes. (result of mango-eating overlaps with arrival)
      c. When I came home, Amitabh was in the bathroom.

Dynamic predicates, on the other hand, do not permit simultaneous interpretation.

(88) DYNAMIC PREDICATES
      a. When I came home, Amitabh ate mangoes. (mango-eating follows arrival)
      b. When I come home, Amitabh will eat mangoes. (mango-eating follows arrival)

Auxiliary-marked predicates in Hindi behave like stative predicates in that they all allow simultaneous readings. This is not surprising when one considers that the constructions that require the auxiliary (i.e. the progressive, the imperfective, the perfect, and the copula), have been analyzed as denoting stative eventualities by a number of researchers (e.g., Dowty 1977, Ferreira 2005, Katz 1995, Husband 2012). The examples below illustrate the use of a past-marked auxiliary to create a past progressive, past perfect, and past copular construction, respectively.

(89) AUXILIARY-MARKED CONSTRUCTIONS
      a. jab   mãĩ gʰar=pe aa   ga-yaa,   tab amitaabʰ aam   kʰaa rah-aa
          when I   home=on come go-PFV.M.SG, then Amitabh mango.M eat PROG-M.SG
          tʰ-aa.
          AUX.PST-M.SG

          'When I came home, Amitabh was eating mangoes.' (mango-eating overlaps with arrival)
      b. jab   mãĩ ghar=pe aa   ga-yaa,   tab amitaabʰ=ne aam   kʰaa-yaa
          when I   home=on come go-PFV.M.SG, then Amitabh=ERG mango.M eat-PFV
          tʰ-aa.
          AUX.PST-M.SG

          'When I came home, Amitabh was eating mangoes.' (result of mango-eating overlaps with arrival)
      c. jab   mãĩ ghar=pe aa   ga-yaa,   tab amitaabʰ bathroom=mẽ **tʰ-aa**.
          when I   home=on come go-PFV.M.SG, then Amitabh bathroom=in be.PST-M.SG
          'When I came home, Amitabh was in the bathroom.'

In Hindi, there are only two constructions that are formed without the auxiliary: the simple perfective (90) and the familiar bare 'future' construction (91). In the perfective, a suffix attaches directly to the verb. In the bare future construction, there is no overt marker of aspect. Both of these auxiliary-less constructions pattern together in that they disallow simultaneous readings with *when*-adverbials, as shown in (92).

(90) amitaabʰ=ne kaam   ki-yaa.
      Amitabh=ERG work.M do-PFV.M.SG
      'Amitabh worked.'

(91) amitaabʰ kaam   kar-e-gaa.
      Amitabh work.M do-SBJ.3.SG-MOD.M.SG
      'Amitabh will work.'

(92) Auxiliary-less Constructions

    a. jab   mãĩ ghar=pe aa   ga-yaa,   tab amitaabʰ=ne aam   kʰaa-yaa.
        when I   home=on come go-PFV.M.SG, then Amitabh=ERG mango.M eat-PFV.M.SG

        'When I came home, Amitabh ate mangoes.' (mango-eating follows arrival)

    b. jab   mãĩ ghar=pe aa-ũũ-gaa,   tab amitaabʰ aam
        when I   home=on come-SBJ.1.SG-gaa, then Amitabh mango.M

        kʰaa-e-gaa.
        eat-SBJ.3.SG-MOD.M.SG

        'When I come home, Amitabh will eat mangoes.' (mango-eating follows arrival)

It thus appears that the presence of the auxiliary marks that a predicate is stative (i.e., allows temporal overlap with the reference time), while the absence of an auxiliary marks that a predicate is dynamically interpreted (i.e., it does not allow temporal overlap). Although the auxiliary covaries with stative interpretations, in most cases, it does not appear that auxiliary itself controls the stativity of the predicate. In many cases, the stativity of the auxiliary's complement is determined by Asp^0. For example, the denotation for the progressive used in the previous section specified the relevant temporal overlap. By the same token, aspectual operators such as the perfective (PFV below) are often thought to encode non-overlap with the reference time directly (often through use of the operator $<$ which denotes non-overlapping temporal precedence — Singh 1998).

(68) $[\![PROG]\!] = \lambda P \lambda t \exists e.[\text{P(e) \& } \tau(e) \circ t]$

(93) $[\![PFV]\!] = \lambda P \lambda t \exists e.[\text{P(e) \& } \tau(e) < t]$

If aspect is responsible for determining whether predicates are stative or dynamic in the constructions above, it stands to reason that aspectual operators perform this function uniformly across all constructions in the language. This entails that aspect is responsible for the dynamic interpretation of bare main verbs. Accordingly, I propose that a covert *prospective* Aspect operator obligatorily occurs with a 'bare' lexical verb (Matthewson 2013). The operator forces an eventive, future-oriented reading of the verb by specifying that the run-time of the event is properly contained within the interval provided by Tense ($\subseteq$). Future orientation is forced because total inclusion within the interval entails that $\tau(e)$ does not overlap with either side of the interval.[38]

(94) $[\![PROSP]\!] = \lambda P \lambda t. \exists e[\text{P(e) \& } \tau(e) \subseteq t]$

According to this analysis, the prospective operator turns its complement VP into a 'derived' dynamic predicate. Some evidence in favor of treating these constructions as 'derived' dynamic predications, as opposed to having aspectual properties determined by the lexical aspect of the main verb, comes from the fact that lexically stative verbs in this construction must also be interpreted as non-overlapping with the reference time. Lexically stative predicates such as 'stay', 'know French', and 'think' (95a-c) cannot receive a present (epistemic) reading when they are bare. They are obligatorily future-oriented (indicated in the case of 'know French' and 'think' by the necessity of an inceptive reading of the predicate).

(95)   a. amitaabʰ {tab | #ab | ab=se}   vahãã rah-e-gaa.
         Amitabh then   now   now=from there stay-SBJ.3.SG-MOD.M.SG

         'Amitabh will stay there then/#now/starting now.'
         # 'Amitabh must be staying there now.'

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[38]See Condoravdi (2002) for use of the inclusion operator to achieve future-shifted readings. It is necessary to state the meaning of the prospective in terms of inclusion ($\subseteq$) rather than simple temporal subsequence ($>$) because we use the open-ended interval (t_0,∞) for the indefinite present tense. If subsequence were used instead of inclusion composing a prospective-marked VP with the open-ended interval (t_0,∞) would result in the following impossible statement $\tau(e) > (t_o, \infty)$, which states that the run-time of the event in question occured after the infinite interval.

    b.   amitaabʰ frenc   jaan-e-gaa.
         Amitabh French know-SBJ.3.SG-MOD.M.SG

        'Amitabh will (come to) know French.'

    c.   ve   log   soc-ẽ-gee   ki   amitaabʰ aam   kʰaa-taa
         DEM.3.PL people think-SBJ.PL-MOD.M.PL that Amitabh mango.M eat-IMPF.M.SG
         hai.
         AUX.PRS.3.SG.

        'They will (come to) think that Amitabh eats mangoes.'
        # 'They must think that Amitabh eats mangoes'

Under this analysis, the structure assigned to the obligatorily future-oriented (85) is (96), and the truth conditions are (97).

(96)
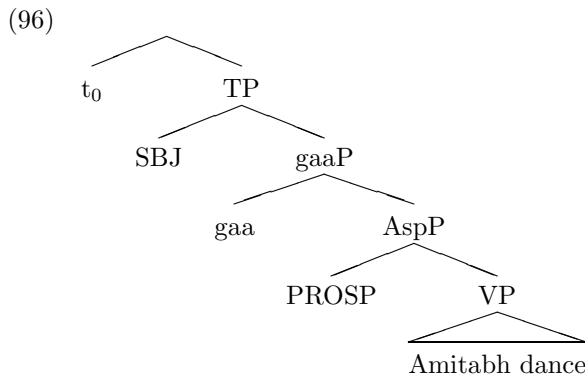
(97) $\forall$w' $\in$ BEST$_{Stereo}$(MB(w$_0$,t$_0$)):$\exists e$[dance(e, Amitabh)(w') & τ(e) $\subseteq$ (t$_\mathrm{o}$, ∞)]

The truth conditions state that the run-time of the event of people dancing is properly contained within the open-ended interval (t$_\mathrm{o}$, ∞) provided by the subjunctive. This forces a future orientation on the assumption that the present moment is not fully contained within this interval. Importantly, the truth conditions enable either an epistemic or circumstantial reading.

Positing a null prospective aspect engenders one minor complication. Copular constructions appear superficially similar to plain-future constructions like those in (95) in that they lack overt aspectual marking. In (98), there is no aspectual operator between the verb and the subjunctive.

(98)   ve   log   kʰuʃ   hõ-∅-gee.
       DEM.3.PL people happy be-SBJ.PL-MOD.M.PL

     'Those people will become/must be happy.'

Prima facie, we might suppose that this configuration would involve use of the prospective aspect, on analogy with the analysis of (95). This analysis would explain the future-oriented reading of (98): with the prospective aspect, the copular construction would be read as a kind of dynamic predicate (consistent with the reading 'Those people will become happy.'). Although this analysis explains the future-shifted reading of (98), it cannot handle the equally possible present epistemic reading of (98). For the present epistemic reading, the copular construction would need to be interpreted as a state, which the prospective aspect marker would block. The question that arises is thus: how could the copular construction receive a stative interpretation? The auxiliary itself cannot act as a stativizer, so the interpretation must arise elsewhere.

There are at least two ways to explain how the bare copula gets interpreted as a stative predicate. One may either assume that a separate (covert) aspectual operator occurs in copular constructions, a default operator that permits overlapping reference with the commanding tense. Such an operator might be required to perform other tasks such as 'stativizing' the copula's predicate (adjective,

noun, etc.) for composition (see Husband 2012. Alternatively, if the predicates selected by copulas are already states (Schwarzschild 2011) that provide a time variable (Tonhauser 2006), it might be possible to assume that bare copular constructions need not have any aspectual marking whatsoever.

To recapitulate the proposal: the absence of a present epistemic reading with superficially 'bare' verbs arises because bare verbs bear a (covert) prospective aspectual operator. This operator makes present temporal reference impossible.[39] Present epistemic readings are possible when *gaa*'s prejacent is a (derived) state because stative predicates permit present temporal reference. The possibility of a present epistemic reading seems to track use of the auxiliary *ho* because the auxiliary's presence correlates with the stativity of the predicate.

7 Remaining Puzzles

Though the analysis covers a wide range of possible readings, there are still a number of empirical and theoretical puzzles that deserve mention. I discuss a few below.

7.1 Matrix Back-shifted Readings

The data discussed in the foregoing text all deal with present and future-oriented readings. Yet it has also been observed that past-oriented epistemic readings are also possible with *gaa* (see Kush 2011 and Sharma 2008). This can occur with a variety of different aspectual operators. In the example below, a perfective-marked verb, in conjunction with a *gaa*-marked auxiliary is used to convey that the time of the comet fall occurred prior to speech time. In previous sections, this construction was referred to as the 'perfect'.

(99) jis   dʰumketu=ke vajah=se   sab dinosaurs mar-e,   vo
     CORR.OBL comet=of   cause=from all dinosaurs die-PFV.M.PL, PRON.3.SG
     mesozoic=ke dauran gir ga-yaa   ho-∅-gaa.
     mesozoic=of during fall go-PFV.3.SG AUX-SBJ.3.SG-MOD.M.SG

     'The comet that killed the dinosaurs must have fallen during the mesozoic.'

Somewhat surprisingly, back-shifted readings are also possible with morphological configurations that provide less evidence for a 'perfect'. For example, (100) illustrates a back-shifted progressive construction. Imagine Amitabh awakens from his nap to find food laid out for him. He can say:

(100) jab   mãĩ so   rah-aa   tʰaa,   mer-e   naukar   kʰaanaa banaa
      when I   sleep PROG-M.SG AUX.PST-M.SG, 1.SG.POSS-PL servant.M food.M   make
      rah-ee   hõ-∅–gee.
      PROG-M.PL AUX-SBJ.PL-MOD.M.PL

      'While I was sleeping, my servants must have been making food.'

Back-shifted readings are also possible with imperfective morphology. Suppose that it is believed that the only way to become a successful actor is to have eaten bananas during childhood. If we know that Amitabh is a successful actor, we can utter the following epistemic claim about his banana-eating activities as a child:

(101) bacpan=mẽ amitaabʰ bahut kele   kʰaa-taa   ho-∅-gaa.
      childhood=in Amitabh many bananas eat-IMPF.M.SG AUX-SBJ.3.SG-MOD.M.SG

      'Amitabh must have eaten many bananas as a child.'

These sentences are form identical to their present counterparts, save for the temporal adverbials that indicate past orientation: *gaa* attaches to a subjunctive-bearing auxiliary, which scopes above an aspectual operator. The sentences pose a compositional challenge for our account because the

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[39]Under this analysis, dispositional readings of bare verbs marked with *gaa*, such as (38), are obligatorily future-oriented. I follow Kissine (2008) in assuming that although statements of this sort express present dispositional modality, they quantify over possible behaviors in the future.

run-time of the VP-denoted event does not overlap within the indefinite present interval provided by the subjunctive. Moreover, these interpretations cannot be due to a back-shifting of the subjunctive. Back-shifted subjunctives were only possible when a past-tense scoped over an embedded subjunctive. The subjunctive is not embedded in either of the examples above.

I tentatively propose that a covert existential perfect operator is responsible for the back-shift in these instances, a move in line with Condoravdi's (2002) decompositional account of back-shifted epistemic modals in English. The exact analysis of the perfect in Hindi is beyond the scope of this paper, but it should be noted that there is independent evidence for a covert perfect operator in Hindi. The forms of non-perfect and perfect sentences are often indistinguishable. The plain progressive is compatible with the non-perfect frame-adverbial ab^hi 'now', as well as the *se*-adverbial (comparable to English *since* adverbials). On the assumption that *se*-adverbials require a perfect context, a covert perfect operator is required to accommodate (102b).

(102) a. mã̃ɪ ab^hi kaam   kar rah-aa   hũ̃ũ.
           I   now work.M do PROG-M.SG AUX.PRS.1.SG

           'I am working now.'
       b. mã̃ɪ dopahar=se kaam   kar rah-aa   hũ̃ũ.
           I   noon=from work.M do PROG-M.SG AUX.PRS.1.SG

           'I have been working since noon.'

There is further suggestive, though by no means conclusive, evidence in favor of a covert perfect operator. In non-modal contexts, the perfect readings require the presence of the auxiliary *ho*. For example, when paired with an auxiliary, perfective morphology can yield a perfect interpretation, as evidenced by the felicity of the since-adverbial. However, without the auxiliary, the perfect reading is unavailable.

(103) amitaab^h=ne dopahar=se k^haa-yaa   hai.
       Amitabh=Erg noon=from eat-PFV.M.SG AUX.PRS.3.SG

       'Amitabh has eaten since noon.'

(104) #amitaab^h=ne dopahar=se k^haa-yaa.
       Amitabh=Erg noon=from eat-PFV.M.SG

       #'Amitabh ate since noon.'

If, for whatever reason, the covert perfect requires the presence of an auxiliary and back-shifted *gaa*-marked constructions are only possible with the covert perfect, we would expect that *gaa*-marked constructions that lack the auxiliary should not be able to be back-shifted. This is what we find. Bare verbs marked with *gaa* cannot have back-shifted interpretations in matrix contexts.

(105) #amitaab^h do din pehele k^haa-e-gaa.
       Amitabh   two days before eat-SBJ.3.SG-MOD.M.SG

       #'Amitabh was going to eat two days ago.'

7.2 Future Imperfectives

In previous sections, we saw that both present and future orientation were generally possible when there was overt aspect on a verb. For example, progressive and perfect constructions could receive a present (epistemic) reading or one of two kinds of future readings. Somewhat surprisingly, there is one construction where only present (epistemic) orientation is possible. It appears that when *gaa* attaches to an auxiliary and the main verb bears imperfective aspect all future orientation is blocked. (106a) shows that we can use an imperfective-marked verb to make a presumptive statement about a group of people's daily rice-making duties, if the rice-making is supposed to be currently ongoing. However, (106b) shows that the analogous future statement is unacceptable. Even if it is assured that daily rice-making is a part of a Japanese chef's job, we cannot use the imperfective-marked

verb and a *gaa*-marked auxiliary to describe the future event. This holds true even though there is nothing *conceptually* incoherent in talking about future imperfective events like habits, dispositions or states which the imperfective is usually used to express.

(106) a. aajkal,   japan=mẽ chef ban   kar,   ve   log   roz   caaval
          nowadays, Japan=in chef become having, DEM.3.PL people daily rice.M
          banaa-tee   hõ-∅-gee
          make-IMPF.M.PL AUX-SBJ.3.SG-MOD.M.SG
          'Nowadays, after having become chefs in Japan, they must make rice on a daily basis.'

      b. #do saal=mẽ, japan=mẽ chef ban   kar,   ve   log   roz   caaval
           two year=in, Japan=in chef become having, DEM.3.PL people daily rice.M
           banaa-tee   hõ-∅-gee
           make-IMPF.M.PL AUX-SBJ.PL-MOD.M.PL
           'In two years, after having become chefs in Japan, they will make rice on a daily basis.'

The restriction on future imperfectives is observed in *gaa*'s absence. Bare subjunctive imperfectives display the same resistance to future reference in the absence of *gaa*. When embedded under a statement of epistemic possibility, a subjunctive auxiliary without *gaa* can pair with an imperfective verb with present orientation. But, as above, any attempt to shift the temporal orientation of the imperfective verb forward results in unacceptability (107b).

(107) a. ho sak-taa   hai   ki ve   roz caaval banaa-tee
          be can-IMPF.M.SG AUX.PRS.3.SG that PRON.3.PL daily rice.M make-IMPF.M.PL
          hõ-∅
          AUX-SBJ.3.PL
          'It's possible that they make rice on a daily basis (nowadays).'

      b. *ho saktaa   hai   ki agle saal ve   roz caaval banaa-tee
           be can-IMPF AUX.PRS.3.SG that next year PRON.3.PL daily rice.M make-IMPF.M.PL
           hõ-∅
           AUX-SBJ.3.PL
           #'It's possible that they will make rice on a daily basis next year.'

It therefore appears that imperfectives disallow future reference *as a general rule*.[40]

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[40]An anonymous reviewer comments that there may be sentences in which an imperfective-marked verb is future oriented. The reviewer offers the example i. as evidence. In the antecedent of the conditional, the event of going to school daily must occur in the future.

   i. (?*)agar agle   saal=tak   ye bacca   roz skul jaa-taa   ho,   to
        if   next.OBL yearM.SG=by this child.M.SG daily school go-IMPF.M.SG AUX.SBJ.3.SG then
        us=ko   das rupya inaam mil-ẽ-gee.
        PRON.3.SG.OBL=DAT ten rupees reward get-SBJ.PL-MOD.M.PL
        'If the kid goes/has gone to school every day till next year, then he will get a 10 rupee reward.'

It is unclear what to make of this data point because I have had difficulty confirming the reviewer's intuition with other native speakers. The reviewer presents the data as acceptable, but most native speakers I have consulted reject the sentence outright (hence the equivocal '?*' in parentheses). Insofar as some speakers understand the intended meaning of the sentence, marginal acceptability appears highly dependent on the use of a *by*-adverbial 'by next year' above. Changing the by-adverbial to a simple adverbial that does not specify a right boundary in the way a by-adverbial does, results in complete unacceptability.

   ii. *agar agle   saal   ye bacca roz skul jaa-taa   ho,   to us=ko   das
         if   next.OBL year.M.SG this kid   daily school go-IMPF.M.SG AUX.SBJ.3.SG then PRON.3.SG.OBL=DAT ten
         rupya inaam mil-ẽ-gee.
         rupees reward get-SBJ.PL-MOD.M.PL
         #'If the kid goes to school every day next year, then he will get a 10 rupee reward.'

Use of a by-adverbial also results in a marginal improvement of (107b), as shown below.

While I do not offer a concrete proposal for this restriction, it suffices to show that this restriction is independent of *gaa*. We may therefore assume that the restriction stems from a restriction imposed by the semantics of the imperfective operator itself.[41]

7.3   Attachment and Interpretation Height

In section 2, I rejected the idea that *gaa* is base generated above Tense on the grounds of agreement. I reasoned that *gaa* must originate lower so that it fell within the scope of the controller of agreement in the clause (the local T head). *Gaa*'s surface position to the right of T was explained with appeal to head-movement or local-dislocation. This movement was assumed not to have any semantic consequences: I provided derivations of *gaa*-marked sentences that interpreted *gaa* in its base position.

There may be reason to suppose, however, that *gaa* should be interpreted above T — or that at least the head movement proposed has semantic consequences. In section 3, following Portner (1998), I argued that the subjunctive must be licensed by a modal and concluded that *gaa* served as the licensor. However, *gaa* should not be able to license the subjunctive in my structures under standard assumptions. It is typically assumed that licensing occurs under c-command/LF-scope, but *gaa* does not c-command the T head in its base or head-moved position. This problem would be solved if *gaa*'s base position were situated above TP, as in (11). However, this clause structure would require additional stipulation to explain how *gaa* agrees with the subject of the clause. Under such an account, *gaa* might act as its own agreement probe, separate from T.

If we do not wish to situate *gaa* above T, two analytical options that present themselves. The first is that head-movement and adjunction of *gaa* to the subjunctive is sufficient to license the morpheme — such a proposal was made for certain cases of NPI licensing in Japanese by Nakao and Obata (2007). The second is that *gaa* must (covertly) raise above T so that it can license the subjunctive. If such movement were indeed to occur, I assume that it would have to originate from *gaa*'s base position because movement of *gaa* out of the complex T head created via adjunction would violate the commonly presumed ban on excorporation (though see Roberts 1991 for arguments that excorporation may be possible). Movement of *gaa* above TP in one fell swoop would run afoul of the head movement constraint (HMC, Travis 1984; see also Matushansky 2006), which prohibits head movement to skip intervening heads as landing sites.

I leave exploration of these options to future research, but note that the denotation of *gaa* provided above will work equally well regardless of whether the morpheme sits above or below TP.

8   Conclusion

This paper has defended a univocal analysis of the Hindi morpheme *gaa* on its uses in plain future and epistemic modal constructions. It was argued that *gaa* is a necessity modal that quantifies over worlds in either a circumstantial or epistemic modal base. It was also argued that *gaa* does not shift the temporal orientation of its prejacent forward. The temporal orientation of *gaa*-marked clauses

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iii. #?ho sak-taa   hai   ki   agle   saal=tak   ve   roz   caaval banaa-tee
       be can-IMPF.M.SG AUX.PRS.3.SG that next.OBL year.M.SG=by PRON.M.PL daily rice.M make-IMPF.M.PL
       hõ-∅
       AUX-SBJ.PL

#'It's possible that they will have been making rice on a daily basis by next year.'

The use of a by-adverbial indicates that these sentences are interpreted as a species of perfect construction. Thus, these data may indicate that future orientation with imperfective marking is only acceptable when the imperfective is embedded underneath another aspectual operator such as the covert perfect. I leave exploring this possibility to future research.

[41]It is possible that the imperfective in Hindi encodes some degree of anteriority, thus making it incompatible with future reference. Rajesh Bhatt (p.c.) suggests support for this idea might come from auxiliary drop patterns with the imperfective. Though the imperfective construction usually requires a tense-marked auxiliary to accompany the verb, this auxiliary can be dropped with past imperfective constructions. This is not the case with present imperfectives. If the imperfective encodes anteriority, deletion of a past auxiliary is recoverable, but deletion of a present auxiliary is not.

is determined by the subjunctive morpheme in the scope of the modal.

Because the account allows modal flavor and temporal orientation and vary as independent parameters, it predicts a wide number of readings. The paper considered the full range of possible interpretations of *gaa*-marked constructions that result from possible combinations of MB, temporal orientation, and aspectual marking. Certain combinations were unattested. The empirical landscape is summarized below.

	Circumstantial	Epistemic	Circumstantial	Epistemic
	Present		Future	
Impf	*Diversity	✓	*?	*?
Prog	*Diversity	✓	✓	✓
Perfect	*Diversity	✓	✓	✓
Copula	*Diversity	✓	✓	✓
Bare	*Diversity/*Aspect	*Aspect	✓	✓

For the most part, the absence of certain readings was argued to arise from independent pragmatic or semantic principles. For example, all present circumstantial readings were argued to be blocked by Condoravdi's (2002) *Diversity Condition*. The obligatory future orientation of superficially bare main verbs was attributed to a covert prospective aspect. Finally, it was observed that the gaa-marked imperfectives could not have future orientation. Although a complete account of this fact was not given, it was suggested that it might reflect idiosyncratic semantic restrictions imposed by the imperfective operator.

Acknowledgments

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