Future Reference and Epistemic Modality in Hindi: The $gaa$ particle

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1 Introduction
This paper is concerned with the interpretation of the Hindi enclitic particle $gaa$, which is often referred to as the ‘future tense’. $Gaa$ is used in plain future assertions, such as (1), where the time at which the people under discussion come is 2 days subsequent to the speech time. $^1$

(1) Vo log do din me aaeN-gee.
3RD people 2 days in come-SUBJ-gaa.3RDPL
‘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. $^2$ (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 morphology and the particle $gaa$, whereas in (2b) the present indicative auxiliary $hai$ is used. The felicity of the adverbial phrase $abhi tak$ (by now) demonstrates the lack of future orientation.

(2) a. Vo log abhi tak aa-yee hoN-gee.
3RD people now by come-Pfv be-SUBJ-gaa.3RDPL
≈‘They must have come by now.’

b. Vo log aa-yee haiN.
3RD people come-Pfv be.Pres.3RDPL
‘They have come.

The paper proceeds from the assumption that the $gaa$ particles 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, among many others, Jespersen 1924; Enc 1996; Hornstein 1990; Sarkar 1998).

(3) They $will$ come in two days. $^3$

(4) They $will$ have come by now. $^3$ They must have come by now.

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. On this analysis future readings would be trivially derived, while epistemic readings would be arrived pragmatically (see, e.g., Kissine’s 2008 proposal for $will$). The second possibility is that $gaa$ is both a temporal and a modal operator. Prior work on the English future marker $will$ has analyzed

$^1$As I am not concerned with the complex pattern of verbal agreement in Hindi, I will not gloss the different inflectional patterns for aspectual markers, $gaa$, or tenses. I will, however, gloss their presence across all sentences.

$^2$This use is often called the ‘presumptive’ (see, for example, Sharma 2008).
the morpheme as a portmanteau— it supplies its complement with both a time argument and a quantified world argument (e.g. Abusch 1998; Sarkar 1998; Copley 2002; Condoravdi 2003). It is possible that a similar analysis would be appropriate for gaa. The third and final option is that gaa is simply a modal operator that makes no contribution whatsoever to the temporal interpretation of its prejacent clause.

In this paper I plump for the third option. This account aligns itself with the tradition of treating apparent future markers as modals (e.g. Thomason 1989; 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.

The paper has a second goal. In recent years, increased attention has been paid to the interaction of modal operators with temporal and aspectual operators in their clause (e.g. Bhatt 2002; Hacquard 2010). Many researchers have shown that aspectual operators constrain the possible interpretations of modal sentences (e.g. Bhatt 2002; Hacquard 2010). In this paper I catalog and account for conspicuous restrictions on the interpretation of some gaa-marked clauses that appear to arise as a function of aspectual marking. Under some circumstances the availability of a future or present epistemic reading with a gaa-marked sentences is limited by an aspectual operator. With some aspectual operators, such as the progressive, both future and epistemic present readings are available.

    when 1SG come-SUBJ-gaa, Amitabh eat PROG aux-SUBJ-gaa
    ‘When I come, Amitabh will be eating.’

   b. Abhi Amitabh khaa raha ho-∅-gaa.
    now Amitabh eat PROG aux-SUBJ-gaa
    ‘Amitabh must be eating now.’

Restrictions are observed in the presence of Imperfective morphology and with ‘bare’ verbs (those verbs lacking overt aspectual operators). Future orientation is impossible when gaa’s prejacent VP bears imperfective morphology, shown below using the incompatibility of future-oriented adverbial phrases.

(6) Vo log {#bhavishya me | aajkal} bahut chaaval banaa-taa ho-N-gee.
    3rd people future in nowadays a-lot rice make-IMPF be-SUBJ-gaa
    ‘They must make rice a lot nowadays.’
    #‘They will make rice a lot in the future.’

The situation appears reversed when gaa attaches directly to (most) ‘bare’ verbs: a present epistemic reading is barred, and future orientation is forced. Once again this is illustrated with the (in-)compatibility of temporal adverbials.

(7) Vo log {bhavishya me | #aajkal} bahut chaaval banaaa-eN-gee.
    3rd people future in nowadays a-lot rice make-SUBJ-gaa
    ‘They will make rice a lot in the future.’
    #‘They must make rice a lot nowadays.’

Although these restrictions are observed when the morpheme is present, I argue that the restrictions have nothing to do with modal-aspect interactions per se, but rather to do with more general principles that govern the felicitous use of aspectual operators.

The structure of the paper is as follows. Section 2 serves as a quick primer of the relevant morpho-syntactic facts. Section 3 presents arguments for treating gaa as a modal operator. Section 4 argues for divorcing tense semantics from the denotation of gaa. Section 5 presents the modal analysis of gaa as a Kratzerian modal with a lexically underspecified modal base parameter (Kratzer 1977, 1991, 2012). Aspectual restrictions are discussed in section 6. Section 7 discusses outstanding puzzles.
2 Morphological Preliminaries

Gaa is an enclitic particle that can attach in a number of positions. It may attach to a subjunctive-marked main verb without aspectual morphology, as it does in (8a) or to the copula in (8b).

(8) a. Vo bacce do din me aa-eN-gee.  
   3RD kids 2 days in come-SUBJ-gaa.3RDPL  
   ‘Those kids will come in two days.’

b. Vo bacce do saal me lambee ho-N-gee.  
   3RD kids 2 years in tall be-SUBJ-gaa.3RDPL  
   ‘Those kids will be tall in two years.’

The particle may also appear on an auxiliary verb ho (identical to the copular ho), when the main verb bears overt aspectual morphology. This is shown with the epistemic reading of gaa with the present perfect, progressive, and imperfective aspect in (9a-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.

(9) a. Vo log abhi tak pahunch-ee ho-N-gee.  
   3RD now by people arrive-PFV be-SUBJ-gaa  
   ‘They must have arrived by now.’

b. Vo log abhi naach rahe ho-N-gee.  
   3RD people now dance PROG be-SUBJ-gaa  
   ‘They must be dancing now.’

   3RD people here often come-IMPF be-SUBJ-gaa  
   ‘They must come here often.’

When gaa attaches to a verb in a standard assertion, it must be paired with subjunctive morphology. Subjunctive marking appears between the verb and gaa and agrees in person, number and gender with the subject (see Butt and Rizvi 2010, Butt and Ramchand 2005).

(10) Vo log caaval banaa-*(eN)-gee.  
   3RD people rice make-SUBJ.3RDPL-gaa  
   ‘They will make rice.’

Despite their obligatory co-occurrence in assertions, we can conclude that gaa and the subjunctive are distinct morphemes. (11a) shows a verb in the imperative mood. Gaa can be added to the base (11a), yielding the ‘future imperative’ in (11b). When gaa attaches to an imperative, it does so without the subjunctive agreement observed in the above examples.

(11) a. Bare Imperative  
   Chaval banaa-iye  
   Rice make-Imper.Polite  
   ‘Please make rice.’

b. Future Imperative  
   Chaval banaa-iye-(N)-gaa  
   Rice make-Imper.Polite-SUBJ-gaa

Even though gaa agrees in person and number with the matrix subject, I henceforth gloss all inflected forms of gaa as simply ‘gaa’ since the morpheme’s agreement paradigm is immaterial to the analysis.

Unlike present, past, or subjunctive markers, gaa does not inflect for person, only for number and gender.
‘Please make rice (at some point in the non-immediate future).’

While *gaa* appears on subjunctive-marked verbs and some imperatives, it cannot be paired with indicative marking.

(12) *Indicative

Vo log aa rahe haiN-(*gee).
3RD people come PROG be.Pres.Indic-gaa

We can therefore make the following generalization about the distribution of *gaa*.

(13) The morpheme *gaa* must co-occur with non-indicative mood morphology.

2.1 *Gaa* Above: Syntactic Position

The syntactic position of *gaa* can be deduced from its linear position vis-a-vis other morphemes. If we assume that *T* is the locus of subject agreement (and mood morphology), we can generalize that *gaa* uniformly surfaces to the right of the *T* head. Subjunctive and imperative mood morphology always precedes *gaa* in the linear string. The scope of operators and morphemes in the verbal domain in Hindi is inversely related to superficial linear order. Using this ordering generalization as our guide, we can conclude that *gaa* occupies a fixed position in the clause, above *T*, across all of its uses. This is schematized below.5

(14) ModP

\[
\text{Mod} \quad \text{TP} \\
\text{gaa} \quad \text{T} \quad \text{AspP} \\
\text{Subjunctive} \quad \text{Asp} \quad \text{VP} \quad \text{\triangle} \\
\quad \text{\ldots}
\]

3 Motivating Modality

In order to show that *gaa* is not a simple tense operator, this section provides evidence that *gaa*-marked clauses display modal properties.

3.1 Subjunctive as Signal

The first argument in favor of treating *gaa* as a modal is that it triggers use of subjunctive mood in assertions, as do other modal operators. 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 (15) or (ii) the antecedent of a conditional (16).

(15) a. Vo caah-taa hai ki maiN ja-uN.
3RD want-IMPF be.3SG PRES C 1sg go-SUBJ
‘He wants me to go.’ lit. ‘He wants that I go.’
b. Umiid hai ki vo Thiik ho jaa-e
Hope be.3SG Masc C 3RD okay be go-SUBJ
‘(I) hope it gets better.’ lit. ‘Hope is that it get better.’

(16) a. Agar vo dudh pi rahaa ho…
If 3RD milk drink PROG be-SUBJ
‘If he’s drinking milk . . . ’

5This position contrasts with Kush’s (2011) proposal that *gaa’s* position varied as a function of its interpretation.
b. Agar us-NE dudh pi-yaa ho...
   If 3sg-erg milk drink-Pfv be-subj
   ‘If he’s drunk milk . . .’

Following Portner (1998), I will assume that the subjunctive must fall within the scope of a modal operator to be licensed. The environments above can all be seen as containing a modal operator that scopes over the subjunctive.

(17) 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 exhibits the same dependence on a commanding modal. Matrix subjunctive is only licensed when there is an overt modal operator like shaayad (‘maybe’), or in deontic questions and in bouletic exhortations, two environments where a covert modal is arguably present (Portner 1998).

(18) Shaayad maiN kal kaam kar-uN
   Maybe 1sg tomorrow work do-subj
   ‘Maybe I will work.’

(19) MaiN kaam kar-uN?
   1sg work do-subj
   ‘Shall I work?’

(20) Amitabh zinda rah-e!
   Amitabh alive stay-subj
   ≈ ‘Long live Amitabh!’

The subjunctive appears dependent on a modal. As such, the question of its licensor in gaa-marked assertions arises. The simplest assumption seems to be that gaa acts as the modal licensing the subjunctive. If this is the case, we would expect gaa-marked sentences to display the properties of modal environments.

3.2 Modal Diagnostics

In addition to licensing the subjunctive, gaa also exhibits a number of other modal characteristics. This section subjects both present epistemic and future gaa-marked sentences to a battery of standard tests for modality, in order to show that gaa is indeed a modal. Though the analysis of epistemic gaa as a modal might not be controversial, for the sake of thoroughness, we first document the way in which it displays modal characteristics. The first test applied is the the Domain Subtraction test, discussed in Condoravdi (2003). Modal sentences require a domain of quantification. Unless clauses can only be deployed when there is a domain of quantification, from which to subtract.

(21) a. He ate cheese yesterday, (# unless there was yogurt).

b. He must have eaten cheese yesterday, unless there was yogurt.

(21a) is infelicitous because the (non-modal) simple past tense doesn’t provide a domain of quantification. (21b), the epistemic modal analogue of (21a), easily accommodates the unless clause. Under a possible worlds analysis of modals, worlds where there is yogurt are subtracted from the set of relevant possible worlds. The identical pattern is observed with epistemic gaa in Hindi, where the construction yadi . . . na is equivalent to unless.
(22) a. #Us-ne cheese khaa-yaa hai, yadi dahi nahiiN thii.
   3sg-Erg cheese eat-Pfv be.Pres, if yogurt NEG be.3sgPast
   ‘He has eaten cheese, unless there was yogurt.’

b. Us-ne cheese khaa-yaa ho-∅-gaa, yadi dahi na ho.
   3sg-Erg cheese eat-Pfv be-Subj-gaa, if yogurt NEG be-Subj
   ‘He must have eaten cheese, unless there was yogurt.’

Domain subtraction can also be used as a test of modality with gaa in future-oriented sentences. Similar to present epistemic gaa, future gaa permits such subtraction.

(23) Vo cheese khaa-ee-gaa, yadi dahi na ho.
   3rd cheese eat-Subj-gaa, if yogurt NEG be-Subj
   ‘He will eat cheese, unless there’s yogurt.’

Another test for modality can be used for future gaa. Some modals support Implicit Conditional readings; they undergo a kind of modal subordination (Klecha 2011, Roberts 1989). (24a) shows that the modal might supports an implicit conditional reading; (24b) shows gaa permits similar subordination.

(24) a. Don’t touch it! It might explode (if you do)!
   b. Usko mat cumna! Vo TuuT ja-e-gaa (agar tum aisa kar-o).
      That-Obl NEG touch! 3rd break go-Subj-gaa (if you that do-Subj)
     ‘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 (25a) and the absence of the corresponding subordinated reading with the simple past tense (25b). The same asymmetry is observed between gaa-marked clauses (25c) and perfective-marked clauses (25d).

(25) 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 new york jaa-e-gii, to vo shaadi me jaa-e-gii. Us-ko mazaa
      If 3rd new york go-Subj-gaa, then 3rd wedding in go-Subj-gaa. 3rd-OBL enjoyment
      aa-e-gaa.
      come-Subj-gaa
      ‘If she goes to New York, she’ll go to the wedding. She will enjoy it.’
   d. Agar vo new york ga-yii, to vo shaadi me ga-yii. #Us-ko mazaa aa-yaa.
      If 3rd new york go-Pfv, then 3rd wedding in go-Pfv. 3rd-OBL enjoyment come-Pfv
      ‘If she went to New York, she went to the wedding. #She enjoyed it.’

In sum, the gaa particle’s obligatory co-occurrence with the subjunctive, its behavior with respect to domain subtraction and its ability to license implicit conditional readings suggest that gaa is a modal. These findings rule out the possibility that gaa is simply a tense marker.

4 Locus of Forward-Shift

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 (now, ∞), where now is an indexical that often evaluates to the utterance time. A variant of Abusch’s denotation for will, the modal underlying will, is below.

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6Perfective marking in Hindi is incompatible with habitual readings, so only a single-event interpretation of this sentence is possible.

7It should be noted that this test also establishes English will as a modal operator.

8These sentences are adapted from examples in Klecha (2011)

9Condoravdi (2002) has argued for extending this treatment. According to her analysis, all modals uniformly shift the time of evaluation forward.
\[ \text{[woll]} = \lambda w' \in M(w_0, t_0): p(w')(\text{now, } \infty) \]

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 might expect a more hygienic picture in a language that has more clearly demarcated mood, tense and aspect categories, such as Hindi does. In fact, I argue that this is what we observe. The division of semantic labor is more evenly split across different functional morphemes in Hindi than in English. Gaa need not have temporal properties 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 is in complementary distribution with present and past tense marking. (27a,b) show that present and past trigger distinct morphology on the auxiliary/copula than the subjunctive (27c). (27a) and (27b) also trigger suppletion, which (27c) does not. (28a) shows that subjunctive and present cannot co-occur on the same verb, (28b) shows the same for the subjunctive and past.\(^{10}\)

(27) a. Vo log bimaar haiN.
    3RD people sick be.3PL.PRES
    ‘They are sick.’

b. Vo log bimaar thee.
    3RD people sick be.3PL.PAST
    ‘They are sick.’

c. . . . Vo log bimaar ho-N.
    3RD people sick be.3PL.PAST
    ‘. . . They are/might be/will be sick.’

(28) a. *Vo log bimaar h-oN-aiN.
    3RD people sick be.-3PL.SUBJ-3PL.PRES
    ‘They are sick.’

b. *Vo log bimaar {thee-N | h-oN-eeN}.
    3RD people sick be.3PL.PAST-3PL.SUBJ be.3PL.SUBJ-3PL.PAST
    ‘They are sick.’

It also appears that the subjunctive does more than mark mood and occupy the syntactic position of a tense. It constrains the temporal orientation of the verb to which it attaches. Subjunctive-marked verbs are compatible with present and future orientation in Hindi, but cannot get past readings. This preference for present and future orientation exists independent of the presence of gaa. Future and present orientation are available in the absence of gaa in all of the environments discussed in section 3.1. Starting with the antecedent of a conditional, the examples below demonstrate the availability of both temporal orientations. (29) and (30) demonstrate that present and future readings can be achieved with a variety of aspectual operators including the progressive and the perfective, respectively.

(29) a. Agar koi abhi dudh pi rahaa ho . . .
    If someone now milk drink PROG be-SUBJ
    ‘If someone is drinking milk now . . . ’

b. Jab main kal aa-un-gaa, agar koi dudh pi rahaa ho . . .
    when 1SG tomorrow come-SUBJ-gaa if someone milk drink PROG be-SUBJ
    ‘If someone is drinking milk when I come tomorrow...’

(30) a. Agar kisi-ne abhi tak dudh pi-yaa ho . . .
    If someone-ERG now by milk drink-PFV be-SUBJ
    ‘If someone has drunk milk by now . . . ’

\(^{10}\) (28a) only shows one possible ordering of the morphemes (Subjunctive - Present), as the other ordering (Present - Subjunctive) would be indistinguishable from the simple present alone.
Past reference is impossible with the bare subjunctive.

(31) 
\[ \text{Jab maiN aa-yaa thaa, agar koi dudh pi rahaa ho... when 1SG come-Pfv be.3sgPast if someone milk drink PROG be-SUBJ} \]

‘If he is drinking milk when I came/had come...’

(32) 
\[ \text{Jab tak maiN aa-yaa thaa, agar kisi-NE dudh pi-yaa ho... when by 1SG tomorrow come-SUBJ-gaa if someone-Erg milk drink-Pfv be-SUBJ} \]

‘If someone has drunk milk by the time I come tomorrow...’

Based on the above data we can conclude that subjunctive-marking is compatible with present and future evaluation times, but not past. This motivates a view of the subjunctive as a kind of indefinite present that supplies as the temporal argument of its complement a rightward open interval encompassing the present and any time thereafter. It denotes, essentially, non-anteriority.\(^\text{11}\)

(33) \[ [Subj]\text{\textsuperscript{g,c}} = (t_0, \infty) \]

Analyzing the subjunctive as an indefinite present that can make temporal reference to the present or future removes the need to treat \( gaa \) as a temporal operator, contra what its traditional classification as a future-marker would suggest.

5 Denotation of \( gaa \)

The foregoing sections have established that \( gaa \) is a modal operator and not a temporal operator. According to Kratzer (1977, 1991), modals must (minimally) be characterized by the domain of accessible worlds that they can quantify over and their quantificational force. In order to provide a denotation for the particle, I present evidence that establishes (i) that \( gaa \) can be either a circumstantial or epistemic modal and (ii) that \( gaa \) has universal force.

5.1 Domain of Quantification

Following Kratzer (1977, 1991, 2012) I assume a modal is evaluated with respect to a modal base (MB). MBs provide sets of worlds that serve as a modal’s domain of quantification. MBs differ with respect to the accessibility relation that restricts the subset of quantified possible worlds. Kratzer (1977, 1991) identified two MBs that are of primary importance for 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.

\[ MB_{\text{Epistemic}}(w,t) = \{ w' : \text{w’ is a world consistent with a body of evidence/beliefs in w at t} \} \]

\[ MB_{\text{Circumstantial}}(w,t) = \{ w' : \text{w’ is a world consistent with a relevant set of facts/circumstances in w at t} \} \]

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. For example, the difference between the interpretation of \textit{must} in the examples below.

(36) a. John \textit{must} exercise (if he wants to lose weight).

\(^{11}\)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 imperfect form in older Indo-Aryan languages.

\(^{12}\)Here and elsewhere I use \( t_0 \) to denote the speech time.
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.

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 is keyed to the circumstantial MB (as proposed for other future markers by Copley 2002; Abusch 2007; Matthewson 2007, a.o.). Claims about the future are claims about what will happen given some state of affairs in the world at present. Epistemic readings arise when the modal takes the epistemic MB. Speakers make a claim about worlds that are consistent with their current evidence.

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? 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 justified in making definitive claims about the future is more the province of epistomology rather than language use. 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 (37). 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.

(37) Sab log jaan-tee haiN ki Amitabh maNs khaa-taa ho-gaa.
    All people know-IMPF aux C Amitabh meat eat-IMPF aux-gaa
    ‘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 (38).

(38) Sab log jaan-tee haiN ki Amitabh maNs khaa-e-gaa.
    All people know-IMPF aux C Amitabh meat eat-Subj-gaa
    ‘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.

In addition to a modal base, Kratzer (1991) 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 (39a) is an example of this. A dispositional ordering source accounts for the ability reading of (39b), whereas a teleological ordering is required for (39c).

\[13\] Such a proposal was put forward by Crouch (1993) for English will.
(39) 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. A stereotypical OS 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.

I assume that the stereotypical OS is also used with future circumstantial modals. This is consistent with previous work on modal approaches to the future (Copley 2002, Matthewson 2006, Werner 2006, a.o.). Use of the stereotypical OS ensures that possible futures quantified over by a modal are only those that conform with plausible continuations of current states of affairs.

It appears that gaa is limited to the stereotypical OS. Gaa-marked constructions do not exhibit any of the other readings that root modals take. The particle 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).

(40) Amitabh roz apnaa kamraa saaf kar-taa ho-∅-gaa.  
Amitabh daily self’s room clean do-IMPF be-SUBJ-gaa  
‘#Amitabh has to clean his room daily.’

(41) Amitabh apnaa kamraa saaf kar-e-gaa.  
Amitabh daily self’s room clean do-SUBJ-gaa  
'#Amitabh will have to clean his room.’

Nor can gaa be used teleologically. A translation of (39c) using gaa is not possible.

(42) Majbuut banne ke-liye, John abhyaaas kar-e-gaa.  
Strong become for, John exercise do-SUBJ-gaa  
‘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. Using 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 OS.

5.2 Modal Strength

Modals can vary in quantificational strength, or force. 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; Matthewson 2011, 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 it is a universal modal. Supposing universal force for gaa would also be consistent prior work on future modals, which are frequently analyzed as universal quantifiers over possible worlds (cf. Condoravdi 2002, Copley 2002, Sarkar 1999, a.o.). 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*. Depending on how reliable or informative one takes such informant-provided translations to be, the variability in translation could indicate that *gaa* has variable force. Such a conclusion would not be entirely unprecedented given recent work on modals with apparently variable force (Davis et al. 2009, Deal 2011). In this section it is shown that *gaa* exhibits the behavior of a necessity modal, on both of its interpretations.

Three tests taken from the literature show that epistemic *gaa* behaves like a necessity modal. The first three tests come from von Fintel & Gillies (2010), where they were used to test the strength of epistemic *must* in English. The first test used I will refer to as the *Contradiction Test*. The test employs the fact that a claim of possibility (♦φ) can be conjoined with the possibility of its negation (♦¬φ), without a contradiction arising. The same is not true with necessity modals.

\[(45)\]
\[
\begin{align*}
&\text{a. } \checkmark \diamond \phi \land \diamond \neg \phi \\
&\text{b. } \# \Box \phi \land \Box \neg \phi
\end{align*}
\]

\[(46)\]
\[
\begin{align*}
&\text{a. John might come and John might not come.} \\
&\text{b. } \# \text{ John must come and John must not come.}
\end{align*}
\]

*Gaa*-marked epistemic claims behave like *must* with respect to this test. A scenario illustrates: Suppose I am planning a party, and what to serve as a light snack is under discussion. The question of whether the guests will eat mangoes is raised. If I would like to assert that it’s consistent with what I know that the guests might or might not be the type of people who eat mangoes, I cannot utter (47).

\[(47)\]
\[
\#\text{Vo 3rd log aam khaa-tee ho-N-gee aur vo log aam nahiin khaa-tee ho-N-gee.} \\
\text{3RD people mango eat-IMPF be-SUBJ-gaa and 3RD people mango NEG eat-IMPF be-SUBJ-gaa} \\
\text{#’They must eat mangoes and they must not eat mangoes.’}
\]

The second test has to do with the types of inferences or deductions that modal statements license in natural discourse. Take the following scenario, adapted from von Fintel and Gillies (2010), Argument 4.2.1: Chris has lost her marbles, but she knows with full certainty that they are either in Box 1 or 2 or 3. She can felicitously utter the strong (48a), but not the weak (48b), where again *shaayad* (‘maybe’) offers epistemic possibility.

\[(48)\]
\[
\text{The marbles are in 1, 2, or 3. I’ve turned over boxes 1 and 2 and the marbles aren’t there.} \\
\text{a. Vo tiisre Dabbe ke-niice ho-N-gee.} \\
\text{3RD third box under be-SUBJ-gaa.} \\
\text{‘They must be under the third box.’} \\
\text{b. } \#\text{Vo shaayad tiisre Dabbe ke-niice hai.} \\
\text{3RD maybe third box under is.} \\
\text{‘Maybe they’re under this box’}
\]

In light of the tests’ outcomes above, it is possible to conclude that *gaa* favors strong readings. Unfortunately, the tests themselves do not conclusively demonstrate that *gaa* is a universal modal. Recent work (e.g. Davis et al. 2009; Deal 2011) has argued that possibility modals in some languages can undergo strengthening in context to produce strong readings. For example, Deal (2011) presents an analysis of the the Nez-Perce modal *o’qa* - which can be used in situations as a strong or weak modal - as a possibility modal whose meaning is strengthened when needed. Deal maintains that *o’qa* is a possibility modal underlyingly, however, because *o’qa* consistently behaves like a possibility modal in downward-entailing contexts. Possibility modals in downward-entailing environments yield stronger claims than necessity modals in the same environments. A prime example of this involves negation. Necessity modals are stronger than possibility modals in upward-entailing contexts, but in downward-entailing contexts this relation is reversed. A negated possibility modal is stronger than a negated necessity.

\[(49)\]
\[
\neg \diamond >_{\text{strength}} \neg \Box
\]

\[(50)\]
\[
\begin{align*}
&\text{a. It is not the case that John might come.} \\
&\text{b. It is not the case that John must come, but he might.}
\end{align*}
\]
(50a) asserts that there is no possibility of John’s coming, while (50b) states that it is not necessary (though it remains possible). If epistemic *gaa* rules out the possibility of its prejacent proposition under negation, it should be analyzed along the lines of *qi‘a*. If it does not, we can conclude that it is lexically specified as a necessity modal. Based on the data below, the conclusion that *gaa* is a necessity modal seems warranted. Epistemic *gaa* in the scope of negation behaves akin to *must*, rather than *might*.14

(51) a. Us-ko nahiN lag-taa hai ki vo log DC me rah-tee ho-N-gree.
3sg-OBL NEG seem-IMPF is C 3RD people DC in live-IMPF be-SUBJ-gaa.
‘It doesn’t seem to him that they must live in DC.’
b. Soc-taa hai ki vo shaayad VA ya DC me rah sak-tee haiN.
think-IMPF is that they maybe VA or DC in live can-IMPF are.
‘He thinks that they might live in VA or DC.’

That (51a) can be followed by (51b) shows that a negated epistemic *gaa* follows the pattern $\neg \Box \phi$, which admits $\diamond \phi$. Thus, epistemic *gaa* is a necessity modal.

To review, three tests show that epistemic *gaa* is a strong modal. It does not permit contradictions, it is compatible with strong inference, and it behaves like a strong modal in the scope of negation.

On its future readings *gaa* also behaves like a necessity modal. For example, the Contradiction Test test shows that *gaa* is a necessity modal on its plain future reading. To demonstrate, note that modals such as *might* admit future readings in English, and that no contradiction arises when *might* ($\phi$) is conjoined with *might*($\neg \phi$).

(52) John might come tomorrow.
(53) John might come tomorrow and he might not come tomorrow.

Conjoining a future *gaa* claim with its negation, results in contradiction - consistent with a necessity interpretation.

(54) #Vo log kal aa-eN-gree aur nahiin aa-eN-ghee.
3RD people tomorrow come-SUBJ-gaa and NEG come-SUBJ-gaa
‘They will come tomorrow and not come.’

5.3 Denotation and Example Derivations

Above it was established that *gaa* is a necessity modal that can quantify over epistemically or circumstantially accessible worlds, ranked according to their stereotypicality. The denotation in (55) is proposed for *gaa*.

(55) $[gaa]^c = \lambda p. \forall w' \in \text{Best}_{\text{Stereo}}(w_0, t_0)(MB(w_0, t_0)): p(w')$

According to the lexical entry proposed, *gaa* takes a proposition (a property of worlds) and plugs in a world variable over which it quantifies universally. The parameter $MB(w_0, t_0)$ stands for the contextually-supplied MB, which is evaluated with respect to the real world ($w_0$) and the speech time (represented as the indexical $t_0$).15 Best$_{\text{Stereo}}$ represents the ordering source. It is a function that picks out the subset of the worlds in

14Testing gaa’s strength in the scope of negation requires embedding gaa under a negated propositional attitude verb. This is so because, as seen above, gaa outscopes clausemate negation.
15In 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 (15), could be considered problematic. This is observed with both epistemic and plain-future gaa. In (15a) the time of epistemic gaa’s evaluation is the past. This is evident by the felicity of the clause which directly refutes the epistemic claim in the present. Were the time of evaluation in the embedded clause present, the follow-up would be infelicitous. In (15b), Saif’s going to the store can have happened previous to the time of utterance, just so long as it happens subsequent to Amitabh’s thinking.

(i) a. Amitabh-ne soc-aa thaa ki Saif aam pasand kar-taa ho-ε-gaa, par abhi voh jan-taa
Amitabh-Pres think-Pfv aux.PAST C Saif mango like do-IMPF be-SUBJ-gaa, but now 3rd know-IMPF
hai ki yeh galat thaa. aux.PRES C this wrong aux.PAST
‘Amitabh thought that Saif must eat mangoes, but now he know’s that’s wrong.’
the MB that are the most normal (according to some hazy standard of normalcy).\textsuperscript{16}

With the denotation of $gaa$ in hand, we can provide examples of how various readings are arrived at. The example below features a progressive-marked verb, with a $gaa$-marked auxiliary. Assume that it is assigned the given structure.

(56) Vo log kaam kar hee ho-N-gee.
3RD people work do PROG be-SUBJ-gaa

\begin{center}
\begin{tikzpicture}
  \node (t) {\textit{PROG}};
  \node (p) [below of=t] {\textit{DP}};
  \node (v) [right of=p] {\textit{V}};
  \node (d) [left of=t] {\textit{DP}};
  \node (w) [below of=v] {\textit{work}};
  \node (g) [above of=t] {\textit{gaa}};
  \node (a) [above of=p] {\textit{they}};
  \node (s) [above of=g] {\textit{T}};
  \node (e) [below of=v] {\textit{do}};

  \draw (t) -- (p);
  \draw (p) -- (v);
  \draw (d) -- (a);
  \draw (g) -- (s);
  \draw (s) -- (e);
end{tikzpicture}
\end{center}

The truth conditions for this sentence can be derived as shown below, where denotations are provided for each numbered node.\textsuperscript{17}

(57) 1. $[1]^c = \lambda e \lambda w. \text{working}(e, \text{they})(w)$
2. $[2]^c = \lambda e \lambda w \exists e. \text{working}(e, \text{they})(w) \land \tau(e) \circ t$
3. $[3]^c = \lambda w \exists e. \text{working}(e, \text{they})(w) \land \tau(e) \circ (t_0, \infty)$
4. $[4]^c = \forall w' \in \text{Best}_{\text{Stereo}(w_0, t_0)}(\text{MB}(w_0, t_0)): \exists e. \text{working}(e, \text{those-people})(w') \land \tau(e) \circ (t_0, \infty)$

In the truth conditions above, there are two degrees of freedom. The MB parameter is not fixed, nor is the temporal orientation set. Because the temporal interval supplied by the subjunctive includes both the present ($t_0$) and any time thereafter, the truth conditions above are consistent with either a future-oriented interpretation or one that is present oriented (and therefore an epistemic claim). The under-determination allows for four different parameter combinations, as shown in the table below. I assume that three of these four conceivable interpretations are available.

<table>
<thead>
<tr>
<th></th>
<th>Present</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epistemic</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Circumstantial</td>
<td>✓</td>
<td>*</td>
</tr>
</tbody>
</table>

The first possible reading, present epistemic, is brought about by choosing the epistemic MB and the lefthand side of the temporal interval for evaluation. This reading can be drawn out more clearly by using the frame adverbial \textit{abhi} (‘now’) to restrict the time of evaluation to the present. The reading is equivalent to the one in (59), where the event’s run-time is restricted to the present or utterance time.

b. Amitabh-ne parsoN soc-aa thaa ki Saif dukaan ja-a-gaa.

Amitabh-Eng 2.days.ago think-Pfv aux.PAST C Saif store go-SUBJ-gaa

‘Amitabh thought 2 days ago that Saif would go to the store.’

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.

\textsuperscript{16}Portner (2009) makes use of a $\text{Best}_g$ function to represent the ordering source, in which $g$ is contextually-specified.

\textsuperscript{17}I assume the following denotation for the progressive aspectual operator for concreteness:

(ii) $[\text{PROG}] = \lambda P \lambda \exists e. P(e) \land \tau(e) \circ t$
They must be doing work now.'

(59) \( \forall w' \in \text{Best}_{\text{Stereo}(w_0,t_0)}(MB_{\text{Epistemic}}(w_0,t_0)) : \exists e. \text{working}(e, \text{those-people})(w') \& \tau(e) \circ t_0 \)

On this reading the worlds quantified over by the modal would be those worlds epistemically accessible from the present (i.e. those consistent with the beliefs of the speaker, or some body of evidence, at the time of utterance). With such a statement, the speaker would convey that it is consistent with her beliefs that the people in question are currently working. The second possible reading is drawn out by changing the adverbial to the future-oriented kal ('tomorrow'). On such a reading the event’s run-time would be located somewhere in the interval between the present and indefinite future. The meaning of the sentence could also be captured by the truth conditions in (61).

(60) Vo log kal kaam kar rahee ho-N-gee.
    3RD people tomorrow work do PROG be-SUBJ-gaa
    ‘They will be doing work tomorrow.’

(61) \( \forall w' \in \text{Best}_{\text{Stereo}(w_0,t_0)}(MB_{\text{Circumstantial}}(w_0,t_0)) : \exists e. \text{working}(e, \text{those-people})(w') \& \tau(e) \subset (t_0, \infty) \)

On this reading, the speaker would assert that in all normal, circumstantially-accessible worlds, the people in question will be engaged in work at some point tomorrow.

The third possible reading would arise if the epistemic MB were chosen in conjunction with a future time of instantiation for the modal’s prejacent. Such a reading would be a future epistemic reading. Here it is important to note that although some future claims require the circumstantial MB, there is nothing in the account that rules out future epistemic claims. Speakers can make predictions about future events that are based on inference. Use of an adverbial like jahaa tak mujhe maalum hai (‘as far as I know’), draws out this possible reading more clearly.

(62) Jahaa tak mujhe maalum hai, vo log abhi kal kar rahee ho-N-gee.
    There,corr up.to 1sg-DAT known is, 3RD people tomorrow work do PROG be-SUBJ-gaa
    ‘As far as I know, people will be working tomorrow.’

(63) \( \forall w' \in \text{Best}_{\text{Stereo}(w_0,t_0)}(MB_{\text{Epistemic}}(w_0,t_0)) : \exists e. \text{working}(e, \text{those-people})(w') \& \tau(e) \subset (t_0, \infty) \)

The last MB-time combination does not appear to be possible. If the circumstantial MB were paired with a present time of instantiation for the modal’s prejacent, readings that quantified over stereotypical versions of the present would be possible. We would expect truth conditions such as those in (65). The adverb philhaal (‘at the moment’), restricts the time of instantiation to the present. We see, however, that a circumstantial reading is not possible.

(64) Vo log philhaal kaam kar rahee ho-N-gee.
    3RD people at.the.moment work do PROG be-SUBJ-gaa
    ‘They will be doing work right now.’

(65) \( \# \forall w' \in \text{Best}_{\text{Stereo}(w_0,t_0)}(MB_{\text{Circumstantial}}(w_0,t_0)) : \exists e. \text{working}(e, \text{those-people})(w') \& \tau(e) \circ t_0 \)

For the moment, I refrain from offering an explanation of the absence of this reading, but I note that the desired reading is essentially equivalent to the non-modal present tense assertion in (66). Universally quantifying over circumstances in the present world at the utterance time entails that one is making a statement about the current state of affairs.

(66) Vo log philhaal kaam kar rahee haiN.
    3RD people at.the.moment work do PROG are
    ‘They are doing work right now.’

We have seen in this section that gaa is a universal modal that quantifies over worlds in the epistemic or circumstantial MB.
6 Role of Aspect: Restrictions on Readings

The examples above displayed how the truth conditions of gaa-marked clauses allowed for both present and future temporal reference. This section considers restrictions observed on the temporal interpretation of gaa-marked clauses. It is observed that the temporal orientation (present or future) of gaa-marked clauses varies as a function of the aspectual operator on gaa’s prejacent verb. Recent work has shown the interaction of modal and aspectual operators to be a potential source of unexpected semantic restrictions (e.g. Hacquard 2010). This section considers whether the temporal restrictions on gaa-marked clauses are attributable to the interaction of the modal with aspect, or whether the restrictions’ origins lie elsewhere. I argue that these restrictions stem from independent constraints on the use of aspectual operators that have nothing to do with the presence of the modal per se. The full paradigm of possible readings vis-a-vis temporal orientation is first described and then explanations for the independent aspectual constraints responsible for the temporal restrictions.

6.1 Combinations of Gaa and Aspect

As noted at the outset, the range of temporal interpretations available for a gaa-marked clause can depend on the aspectual marking of that clause. With progressive (and perfective) morphology, both future and present (epistemic) interpretation are possible, as shown below.

\[(67)\]
\[
a. \text{Jab main shaadi me aa-uN-gaa, vo log naach rahe ho-N-gee.} \\
\quad \text{when 1SG wedding in come-SUBJ-gaa, 3RD people dance PROG be-SUBJ-gaa} \\
\quad \text{‘When I enter the wedding, they will be dancing.’} \\
b. \text{Abhi vo log naach rahe ho-N-gee.} \\
\quad \text{now 3RD people dance PROG be-SUBJ-gaa} \\
\quad \text{‘They must be dancing right now.’}
\]

There are two cases where aspectual marking seems to restrict this temporal flexibility: (i) when the verb bears imperfective morphology and (ii) in some cases when the verb is ‘bare’, or does not bear any overt aspectual morphology.

To first look at imperfectives, future orientation is not possible when the main verb bears imperfective aspect and the auxiliary is gaa-marked. Only present reference is possible. 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. \((68a)\) shows that present reference is possible with a gaa-marked auxiliary and an imperfective-marked verb. We can 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, \((68b)\) 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.

\[(68)\]
\[
a. \text{Aajkal, japan me chef ban-kar, vo log roz chaaval banaa-tee ho-N-gee} \\
\quad \text{Nowadays, japan in chef become-PART, 3RD people daily rice make-IMPF be-SUBJ-gaa} \\
\quad \text{‘Nowadays, after having become a chef in japan, they must make rice on a daily basis.’} \\
b. \#Do saal me, japan me chef ban-kar, vo log roz chaaval banaa-tee \\
\quad \text{2 years in, japan in chef become-PART, 3RD people daily rice make-IMPF} \\
\quad \text{ho-N-gee} \\
\quad \text{be-SUBJ-gaa} \\
\quad \text{‘In two years, after having become a chef in japan, they will make rice on a daily basis.’}
\]

Next consider the case of ‘bare’ verbs. By using the term ‘bare’, I intend to pick out verbs that lack overt aspectual operators: such verbs only have subjunctive marking and gaa affixed directly to their root. Bare-verbs are usually restricted to future reference. For example, the bare counterpart to the sentence in \((68)\) given below in \((69)\) can only be used to denote future reference, it cannot be used to make a present (epistemic) claim.
(69)  a. Agle saal Amitabh chaaval banaa-e-gaa.
    Next year Amitabh make-SUBJ-gaa
    ‘Next year, Amitabh will make rice.’

  b. #Abhi amitabh chaaval banaa-e-gaa.
    Now Amitabh make-SUBJ-gaa
    ‘Now Amitabh will make rice.’

This restriction is a broad one, applying across distinctions in predicate types. For example, the restriction to future reference applies to all verbs irrespective of their lexical aspect. (70a-c) illustrate the generality of the restriction with a variety of predicates: the stative rahanaa (‘to stay’), the propositional attitude socnaa (‘to think’) and the stative predicate French jaanaa (‘to know French’), respectively.

(70)  a. Amitabh {tab | #abhi | ab se} vahaa rah-e-gaa.
    Amitabh then now now from there stay-SUBJ-gaa
    ‘Amitabh will stay there then/#now/starting now.’
    # ‘Amitabh must be staying there now.’

  b. Amitabh soc-e-gaa ki . . .
    Amitabh think-SUBJ-gaa C . . .
    ‘They will think that...’
    # ‘They must think that...’

  c. Amitabh {#is samay | a gle saal} French jaan-e-gaa
    Amitabh this time next year French know-SUBJ-gaa
    ‘Amitabh will know French {#at this time | next year}.’
    # ‘Amitabh must know French (at this time).’

There is, however, one important exception to this restriction: the bare copula. The bare copula may have either a present (epistemic) or future interpretation. The epistemic (71a) could, for example, be uttered if Amitabh is a groom-to-be and his current, presumed, state of bliss were under discussion. (71b), the future analogue, could be uttered if one were trying to convince a nervous and doleful Amitabh’s mother that, in time, his marriage would make him happy.

(71)  a. Amitabh abhi khush ho-∅-gaa.
    Amitabh now happy be-SUBJ-gaa
    ‘Amitabh must be happy now.’

  b. Amitabh 2 saal me khush ho-∅-gaa.
    Amitabh 2 years in happy be-SUBJ-gaa
    ‘Amitabh will be happy in 2 years.’

The table below summarizes the distribution of temporal readings available with particular aspectual marking. My separating out the bare copula from the set of other bare verbs should not imply that I believe the construction merits a distinct morphosyntactic analysis. I have separated it out simply for exposition.

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Present</th>
<th>Future</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progressive</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Perfect(ive)</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Imperfective</td>
<td>✓</td>
<td>*</td>
</tr>
<tr>
<td>Bare</td>
<td>*</td>
<td>✓</td>
</tr>
<tr>
<td>Bare Copula</td>
<td>*</td>
<td>✓</td>
</tr>
</tbody>
</table>


6.2 Ruling Out Readings

We must explain why future orientation is not available with imperfective morphology, and why present (epistemic) reference is blocked with bare non-copular verbs. Here, I consider whether the explanation of these restrictions should make any reference to the presence of the modal *gaa* and its relation to aspectual operators. I show that the restrictions arise (i) in the absence of the particle and as a result of general principles governing the form of expressions that have little to do with *gaa*. They are therefore not due to modal-aspect interactions, unlike other semantic effects (such as actuality entailments, e.g. Hacquard 2010).\(^{18}\)

6.2.1 No Future Imperfectives

The restriction on future imperfectives is observed in *gaa*’s absence. Subjunctive imperfectives display the same resistance to future reference in the absence of *gaa*. I use the antecedent of a conditional as the environment in which to exhibit this. We see in (72a) that present reference is acceptable with an imperfective-marked verb, but (72b) shows that future reference is not acceptable.

\[
\begin{align*}
(72) & \quad \text{a. Agar vo aajkal roz chaaval banaa-taa ho} \\
& \quad \text{If 3rd nowadays daily rice make-IMPF be-SUBJ} \\
& \quad \text{‘If he makes rice nowadays…’} \\
& \quad \text{b. #Agar vo do saal me roz chaaval banaa-taa ho} \\
& \quad \text{If 3rd 2 years in daily rice make-IMPF be-SUBJ} \\
& \quad \text{‘If, in 2 years, he makes rice daily…’}
\end{align*}
\]

It therefore appears that imperfectives disallow future reference as a general rule. While I do not offer a concrete proposal for this restriction, it suffices to show that this restriction is independent of *gaa*.\(^{19}\)

6.2.2 ‘Bare’ Verbs and Epistemic Readings

The fact that present (epistemic) readings are permitted on bare copulas, but not other bare verbs is independent of the presence of *gaa*. In two environments where the subjunctive was shown to permit either present or future reference (in the complement of a bouletic, and the antecedent of a conditional), we see that present temporal reference is blocked with non-copular verbs, but the copula permits both present and future reference. In (73a), the bare verb in the clause dominated by the verb ‘want’ cannot be read with a present time of instantiation. Only a future instantiation time is acceptable. However, a bare copula in the same position can receive either a present or future time of instantiation (73b). The same pattern is observed in the antecedent of a conditional (74).

\[
\begin{align*}
(73) & \quad \text{a. MaiN caa-taa huN ki vo ja-eN.} \\
& \quad \text{1sg want-IMPF be.1sgPres C 3rd go-SUBJ} \\
& \quad \text{‘I want them to go.’} \\
& \quad \# ‘I want them to be going.’ \\
& \quad \text{b. MaiN caa-taa huN ki vo {bhavishya me | abhi} khush ho-N.} \\
& \quad \text{1sg want-IMPF be.1sgPres C 3rd future in now happy go-SUBJ} \\
& \quad \text{‘I want them to be happy {in the future | now}.’}
\end{align*}
\]

\[
\begin{align*}
(74) & \quad \text{Agar vo {kal | #aajkal} dudh pi-eN} \\
& \quad \text{If 3rd tomorrow nowadays milk drink-SUBJ}
\end{align*}
\]

\(^{18}\)This conclusion stands in direct opposition to a proposal due to Kush 2011, where it was argued that the restrictions in question were related to the modal’s attachment height in the semantic tree.

\(^{19}\)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.
‘If they drink milk tomorrow/#nowadays...’

b. Agar vo {bhavishya me | abhi} khush ho-N.
   If 3rd future in now happy go-SBJ
   ‘If they’re happy {in the future | now}.’

In both of these constructions, *gaa* is absent, but the restriction is nevertheless observed. While showing that the restriction exists independently of *gaa* is enough to defeat the idea that the restrictions arise in relation to *gaa*’s interpretation, it is possible to do more. In this section I attempt an explanation for this pattern. The idea explored here adapts a proposal from Deo (2006, 2011) to suggest that the etiology of this asymmetry lies in an independent phenomenon of aspectual competition, which blocks present reference with non-copular bare verbs. The phenomenon has to do with how utterances are encoded in Hindi, and how appropriate aspectual morphemes are chosen to express intended meanings.

Deo (2006, 2011), building in turn on ideas from Kiparsky (2005) and Koontz-Garboden (2004), argued that competition between aspectual morphemes arises from the interaction of two countervailing universal constraints on utterance encoding: EXPRESSIVENESS and ECONOMY. EXPRESSIVENESS is a kind of faithfulness constraint that prefers using specific or overt morphological exponents that correspond to underlying semantic distinctions in the intended message. ECONOMY, on the other hand, states that one should overtly encode as little as possible while remaining consistent with the intended message. This principle thus favors encodings that are underspecified. Deo (2006, 2011) argued, based on different data, that EXPRESSIVENESS outranks ECONOMY in Hindi. As a result of this ranking, in cases where potential encodings are in competition, Hindi will prefer the encoding that makes use of more explicit aspectual morphology.

The competition analysis of the interpretive asymmetry of *gaa*, roughly stated, is this. Present temporal reference with a bare verb is blocked by EXPRESSIVENESS if the same interpretation could be achieved deploying an overt/contentful aspectual operator. More concretely, we do not get present epistemic readings of (70) because present reference is blocked with the bare form. (70a) illustrates on the relevant reading.

(70) a. Vo log #abhi vahaa rah-eN-gee.
   3RD people now there stay-SBJ-gaa
   ‘They will stay there (starting) now.’
   # ‘They must be staying there now.’

   EXPRESSIVENESS will block present reference with (70a) if there are constructions in competition with (70a) that make use of more specific/overt aspectual exponents. What could the competing constructions be? If we consider the range of possible propositions that make reference to the present with a given verb like *rahanaa* above, we will find that all conceivable propositions expressing a present event of staying, are better expressed using either the progressive or the imperfective. We may want to talk about an ongoing, atomic event of staying, in which case the progressive will be preferred over the bare. Alternatively, we might want to talk about a non-atomic event of staying, in which case the imperfective is the right operator to use. These alternative encodings are shown below.

(75) a. Vo log abhi vahaa rah-tee ho-N-gee.
   3RD people now there stay-IMPF be-SBJ-gaa
   ‘They must live/stay there nowadays.’

   Given the existence of these competing forms, the bare form will be dispreferred. We can now turn to another example with an i-level/stative predicate *French jaannaa* (‘to know French’). Once again, the combination of bare verb and *gaa* does not permit a present (epistemic) reading.
With such statives progressive marking is barred by the well-known incompatibility of progressive aspect and stativity (Dowty 1989). Thus, unlike verbs which permit progressive, there is one less potential encoding in competition with the bare verb vying for compatibility with present reference. Yet, though the progressive is not an option, imperfective-marking is. Present reference with such statives is possible with imperfective marking, and will therefore be preferred over the bare verb.

Once again, since an alternative encoding exists for making present reference, the encoding using the bare verb will be blocked.

Unlike other verbs, the bare copula is rarely, if ever, in competition with alternative forms when referring to the present. This is due to the fact that additional constraints block the use of imperfective and progressive morphology with the copula. As a result, bare forms are often the only option for present copular meanings. (78a) shows that a bare form of the copula (the present hai) is used to talk about the current location of an individual. This meaning could not be expressed using the imperfective (78b), or the progressive (78c). The former is blocked by a previously observed constraint that bars use of imperfective copulas with individual subjects (cf. Bhatt and Pancheva 2005)\textsuperscript{20}, the latter is impossible given the well-known constraint on pairing progressive aspect with stative predicates (cf. Dowty 1979). If the verb ho is paired with the progressive, a quasi-achievement reading is coerced. The same phenomenon is exhibited in (79) using a different predicate udaas ho-na (‘to be sad’). The bare copula is required to talk about Amitabh’s current state; use of different aspectual morphology blocks the intended meaning.

To return to the specific examples above, (71a) is not in competition with other forms that could make present reference and have the same interpretation. (80a) is excluded for the same reason as (71b). (80b)
does not compete with (71a) because the reading of the progressive-marked stative *ho* is the coerced reading of a ‘becoming’ event. Since ‘becoming happy’ and ‘being happy’ are not equivalent predicates, there is no basis for comparison.

(80)  
a. #Amitabh abhi khush ho-taa ho-∅-gaa.  
   Amitabh now happy be-IMPF be-SUBJ-gaa  
b. Amitabh abhi khush ho raha ho-∅-gaa.  
   3RD now happy be-IMPF PROG be-SUBJ-gaa  
   ‘Amitabh must be becoming happy now.’  
   #‘Amitabh must be happy now.’  

Since these other forms are not possible, there is no comparison class with which EXPRESSIVENESS can work, so present reference with the bare copula passes through unscathed.

7 Remaining Puzzles

7.1 Modal Flavor and Attachment Height

The present proposal for the semantics of *gaa* hews rather closely to Kratzer’s (1977, 1991) account of modals with respect to how modal flavor is determined, or provided by the context. More recently this rather permissive system has been revised. Hacquard (2010) has argued that differences in modal flavor correlate with a modal’s position in the syntactic/semantic tree. Essentially, wherever a modal composes determines its flavor. This thesis aligns with the old observation that epistemic modals appear to ‘scope high’, while root modals appear to ‘scope low’ (e.g. Jackendoff 1972; Brennan 1993; Cinque 1999).

The present analysis of *gaa* holds that the particle’s (overt) position in the syntactic tree appears to be fixed, regardless of its interpretation. The modal uniformly surfaces to the right of the subjunctive morpheme and therefore (by hypothesis) above Tense. If the overt position of the modal is taken to reflect the position at which it is interpreted (as all derivations in this paper have assumed), the current proposal would appear at odds with Hacquard’s analysis.

7.2 Back-shifted Readings

The data discussed in the foregoing text all deal with present and future-oriented readings, yet past-oriented epistemic readings are also possible with *gaa* (as noted in 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.

(81)  
Jis dhumketu ke-va-jah-se sab dinosaurs mar-e, voh mesozoic ke-dauran gir ga-yaargent 
   CORREL comet because-of all dinosaurs die–PFV; 3RD mesozoic during fall go–PFV  
   ho-∅-gaa.  
   be-SUBJ-gaa  
   ‘The comet that killed the dinosaurs must have fallen during the mesozoic.’

Back-shifted readings are also possible with progressive morphology. As an illustration, imagine Amitabh awakens from his nap to find food laid out for him. He can say:

(82)  
Jab maiN so raha thaa, mere naukar khaanaa banaa rahee ho-N-gee.  
   When 1SG sleep PROG be.3SG.PAST, 1SG.Poss servants food make PROG be-SUBJ-gaa  
   ‘While I was sleeping, my servants must have been making food.’

Back-shifted readings are also possible with imperfective morphology.
Finally, back-shifted readings are possible with imperfective morphology, too. 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:

(83) Bachpan me Amitabh bahut khaaa-taa ho-∅-gaa.
Childhood in Amitabh many banana eat-IMPF be-SUBJ-gaa

‘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. These sentences pose a compositional challenge for our account for the following reason. It was proposed that the subjunctive can essentially act as a present or future tense. The subjunctive was shown to be inconsistent with past interpretations. In view of this, it would appear that there are no operators in a sentence such as (82) that could bear the responsibility for the back-shift.

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 *abhi* (‘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 (viii-a).

(84) a. MaiN abhi kaam kar rahaa haaN.
1sg now work do PROG be.1SG.PRES
‘I am working now.’

b. MaiN dopahar se kaam kar rahaa haaN.
1sg noon since work do PROG be.1SG.PRES
‘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.

(85) Amitabh-ne dopahar se khaayaa hai.
Amitabh noon since ate-Pfv aux.Pres
‘Amitabh has eaten since noon.’

(86) #Amitabh-ne dopahar se khaayaa.
Amitabh noon since ate-Pfv
‘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.

(87) #Amitabh do din pehele khaaa-e-gaa.
Amitabh two days before eat-SUBJ-gaa
#‘Amitabh was going to eat two days ago.’
7.3 Future Imperatives

I argued that *gaa* was not a temporal operator. There is one case, however, where it would appear that *gaa* contributes a distinct forward-shifting semantics to a construction. It is perfectly acceptable to use a polite imperative such as (88), in which one can ask for a task to be performed immediately. Polite imperatives (as seen before), can also bear the *gaa* particle. Interestingly, when *gaa* attaches to an imperative, it becomes infelicitous to use the imperative to request immediate action.

(88) Abhi caaval banaa-iye
    Now Rice make-Imper.Polite
    ‘Please make rice now.’

(89) (#Abhi) caaval banaa-iye-gaa
    Now Rice make-Imper.Polite-gaa
    ‘Please make rice (at some later point).’  #‘Please make rice now.’

I leave working out this construction to future work.

8 Conclusion

This paper has defended a univocal analysis of the Hindi particle *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* is not a temporal operator - temporal orientation of *gaa*-marked clauses is determined by the subjunctive morpheme in the scope of the modal. Further temporal restrictions on *gaa*-marked constructions were shown to arise from independent restrictions on the felicitous deployment of aspectual operators that have nothing to do with the presence of *gaa* per se.

References


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