

# Grounding with particles

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## Abstract

We focus on a *sui generis* grounding move in Hindi-Urdu dialogue, namely *voh hi na*. A dataset consisting of minimal pairs of dialogues is presented to get a better sense of the move. Using dynamic models of discourse structure, we propose a semantics for *voh hi na* in terms of its update effects.

## 1 Introduction

Grounding moves are an important part of any dialogue (Clark and Schaefer, 1989; Ginzburg, 1996). *Inter alia*, they are important for purposes of coherence and cooperativity in dialogue. Recent work has also shed light on their importance for understanding clause-types *per se* (Farkas and Bruce, 2010). Moreover, the recent past has seen a boom in the literature on discourse particles (Rojas-Esponda, 2014; Theiler, 2021; Yuan, 2020). Within this boom, there has also been a focus on exploring the rich ground for Hindi-Urdu discourse particles (Brown, 2022; Deo, 2022, 2023b; Jabbar, f.c.).

We bring the two lines of work, grounding moves and discourse particles, together to study a *sui generis* grounding move in Hindi-Urdu, *voh hi na*. What is noteworthy about this string is that it has two discourse particles, *hi* and *na* appended to a propositional anaphor *voh*.<sup>1</sup> *Voh* is a third-person pronoun that can also function as a propositional anaphor in dialogues.<sup>2</sup>

To give a sense for its use, which we make more precise below, *voh hi na* is licensed only in contexts where the interlocutor comes to see the speaker’s point of view.

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<sup>1</sup>*toh* is another particle in Hindi-Urdu, and interestingly, one can infix *toh* in *voh hi na* as in *voh hi toh na* to form another felicitous string. For now, we focus on *voh hi na* and add remarks about infixing *toh* in our conclusion below.

<sup>2</sup>See Bhatia and Bhatt (2023) for some data on this pronoun.

- (1) A: The pizza’s stale.  
B (stubbornly takes a bite): Yeah, it tastes pretty bad.  
A: Voh hi na.

In its above sense, *voh hi na* is similar to *told you so*. That’s a good place to start, which we modify step-by-step in light of the data we present here. We proceed as follows: in §2, we make a few ground-clearing remarks. In §3, we construct minimal pairs of contexts and dialogues to see when it is felicitous to use *voh hi na*. We propose a semantic account in §4. Using the account, in §5, we explain the data we present. In §6, we conclude.

Via this paper, we seek to contribute in the following ways to the literature. Although there’s a lot of insightful work on discourse and question particles in Hindi-Urdu, to our knowledge, there’s not much work on the semantics and pragmatics of Hindi-Urdu dialogue.<sup>3</sup> We motivate inquiry into Hindi-Urdu dialogue by presenting a unique grounding move. We also observe that the string *voh hi na* is interesting in that two discourse particles *hi* and *na* contribute a compositional meaning. This is noteworthy in light of the dearth of work on discourse particles composition.<sup>4</sup> For this paper, we only focus on the compositional meaning, without breaking down the individual contributions of the two particles.<sup>5</sup>

## 2 Preliminaries

Before we move on to our explicandum, we remark briefly on grounding moves. The simplest way to understand the nature of grounding, for the purposes of this paper, is to note that assertions are

<sup>3</sup>For the polar question particle *kya*, see Bhatt and Dayal (2020); Biezma et al. (2022).

<sup>4</sup>Zimmermann (2011)’s overview on discourse particles includes discussion of some thorny issues surrounding scope and composition.

<sup>5</sup>The reader is directed to Bhatt (1994); Deo (2023a); Jabbar (f.c.) for more on these two particles.

tentative; assertions are proposals to make some content common ground. In this way, assertions are subject to acceptance for their content to be made common ground. With this notion of acceptance in mind, one can understand a subclass of grounding moves as moves in the discourse that accept and thereby acknowledge assertions.<sup>6</sup> In this paper, we focus on a member of this subclass of grounding moves in Hindi-Urdu. Given this characterization, we can say that A's final move in (1) grounds B's assertion. Sure the content of the grounded assertion becomes common ground, but we take it upon ourselves to show that *voh hi na* does more than just accepting the content of the grounded assertion.

We take *voh hi na* to be a grounding move because a speaker cannot use it, on its own, without a prior utterance by an interlocutor. Simply, it cannot be used as the first move in a discourse by a speaker. Something ought to have come before it which it grounds. Its uniqueness arises out of the conditions of its felicitous use. Given that *voh hi na* can only be used to ground, and never out of the blue, and given that it is licensed under very specific conditions, we take that the unique grounding update is conventionally encoded in the string as its compositional meaning. Let's take a closer look at this string.

*Voh* is a third person pronoun, and translates to *that* in English. Just like English *that*, *voh* can also be used to form referring expressions that can be used deictically to refer to salient individuals in discourse.<sup>7</sup> However, in its referential uses in Hindi-Urdu, *voh* cannot be appended with a sequence of particles as in *voh hi na*. In other words, a speaker cannot point to a person *X* and say *voh hi na* to refer to *X*. *Voh hi na* can be used felicitously only when *voh* is anaphoric on an antecedent proposition, as can be noted in the dialogues we present. That is why we call the *voh* in felicitous *voh hi na* strings, *propositional anaphor*.

The above way of characterizing *voh hi na* is helpful. We can break down the string into the the antecedent proposition for *voh*, call it *p* for now, and isolate the contribution of *hi na* as is standard in the literature on discourse particles and clause-types. To wit, *hi na* somehow relates *p* to the structure of the discourse or some (epistemic) states or preferences of the participants (cf. Kaufmann

<sup>6</sup>See Clark and Schaefer (1989) for a hierarchy of grounding moves.

<sup>7</sup>Complex demonstratives as in *that man with the mustache* serve just this purpose. See King (2001) for an overview.

(2011); Condoravdi and Lauer (2012); Rett (2011)). Therefore, we break down our inquiry into *voh hi na* as consisting of the antecedent proposition for *voh*, and the specific way the proposition is coherent in the discourse. These coherence conditions specify the felicitous distribution of *voh hi na*. In future work, we intend to explore how *hi* and *na* interact compositionally to yield the felicity conditions we specify for *voh hi na*. In this paper, we simply offer the felicity conditions.

Given that we have already broken down *voh hi na* in noting that it consists of a propositional anaphor and two discourse particles, we don't present glosses for our dialogues below. Instead, for brevity's sake, each of the dialogues consists of English sentences. In all dialogues, the final move is *voh hi na*, which we hold constant, varying only in its felicity, across dialogues.

### 3 Dialogues and analysis

Our strategy in this section is to situate each dialogue in a context. Each context specifies the information states of the discourse participants and other related facts. While dialogues are numbered as usual, contexts are given names for ease of recall later. First, consider (2) in STROLL 1 and (3) in STROLL 2.

[STROLL 1]: A and B are in Manchester, and it has been rainy for the past few days. It's a new day now. B puts on her jacket to prepare for taking a stroll, when A expresses his suspicion that it may be raining.

- (2) A: You're being optimistic. It's probably raining outside.  
B (checks the weather app): Yeah, there's a 100% chance of rain.  
A: Voh hi na.

[STROLL 2]: A and B are in Manchester, and it has been rainy for the past few days. It's a new day now. A and B are excited to take a pre-planned stroll outside. As a last minute consideration before leaving, B checks the weather app.

- (3) B (checks the weather app): Oh, there's a 100% chance of rain.  
A: # Voh hi na.

The minimal pair of dialogues above helps bring out the following point: to be able to felicitously use *voh hi na* to ground an utterance *u*, the speaker had to have made a prior commitment *q* in the dis-

course. Moreover,  $q$  must occur prior to  $u$  and the content of  $u$  must verify or validate  $q$  somehow. Here, we use the notions *verification* and *validation* pre-theoretically; we make them precise below. Then, with a notion of validation, yet to be made precise, we can state an observation below.

- (4) **Observation 1:** The speaker who grounds  $u$  with *voh hi na* ought to have made a prior commitment that the interlocutor validates with  $u$ .

In the same vein, consider another context.<sup>8</sup>

[VEGAN]: A and B are discussing whether there are good restaurants on campus. A is vegan, while B is not. They have the following exchange:

- (5) A: I haven't had any good food from a restaurant here on campus yet.  
 B: The restaurant in the south end has really nice burgers ... oh, wait, but you're vegan. You can't go there.  
 A: Voh hi na.

A's use of *voh hi na* above is felicitous. However, the use would have been infelicitous had A not been vegan, and had B's recommendation for the south end restaurant been helpful for A. Note that this recommendation by B is presented primarily to guide A's future actions. This recommendation would have been effective, according to B, had A not been vegan.

[NOT VEGAN]: A and B are discussing whether there are good restaurants on campus. Neither A nor B is vegan. They have the following exchange:

- (6) A: I haven't had any good food from a restaurant here on campus yet.  
 B: The restaurant in the south end has really nice burgers.  
 A: # Voh hi na.

Now, knowing about the south end restaurant can influence A's actions in the following way. After coming to know that there's a nice burger place in the south end, A might not consider eating on campus to be as sub-optimal as A was considering it prior to knowing about the burger place. It's also quite possible that A may still consider eating on campus to be as sub-optimal after coming to know

<sup>8</sup>For the following pair, for ease, we assume that it's common ground between A and B that none of the places on campus serve vegan burgers.

about the restaurant. However, if B knows that the recommendation for the south-end restaurant is futile, B wouldn't offer it—or so A thinks. According to A, what drives B to offer the recommendation is the following open possibility: that in light of B's contribution, A might come to consider eating on campus to be not as sub-optimal. From A's perspective, that's exactly what motivates B to make that specific contribution in the first place. In VEGAN however, B comes to recall that A is vegan. This knowledge makes B no longer believe that *the south end restaurant has nice burgers* would make A change A's preference about eating on campus. As the proposition that A is vegan is specifically stated by B, A is privy to B's mental state that B's prior contribution *the south-end restaurant has really nice burgers* preserve A's preferences over the set of actions, as A is vegan. The minimal difference in the two contexts again brings out the difference in the felicity of *voh hi na*. What observation can we distill here?

From STROLL 1 and 2, we were able to understand that to felicitously ground with *voh hi na*, the speaker ought to have made a prior commitment that the utterance preceding the grounding somehow verifies.<sup>9</sup> Let the content of the interlocutor's utterance be  $p$ . In light of (5) and (6), we observe that the speaker should have the following belief about  $p$ : that the interlocutor thinks that updating the speaker information state with  $p$  does not change the speaker ranking for a salient set of alternative actions. Using this condition, we can understand the notion of verification, introduced above, precisely. What is verified or validated is then the speaker ranking for a set of alternative actions. We note this as observation 2 below and refer to it as *rank preservation* alternatively.

- (7) **Observation 2/Rank-preservation:** The speaker thinks that according to the interlocutor, the speaker ranking for a salient set of alternative actions does not change once the antecedent proposition for *voh* as in *voh hi na* is made common ground.

Note that (7) involves reasoning about the interlocutor's mental state. This mental state is about a set of alternative actions  $\mathcal{A}$ , a proposition  $p$ , and the speaker preferences over  $\mathcal{A}$  in light of  $p$ . Such

<sup>9</sup>All throughout the paper, by *speaker*, we mean the speaker of *voh hi na*, and by *interlocutor*, the participant whose move gets grounded by *voh hi na*.

reasoning about other’s mental states is crucial in dialogue; not only for the purposes of fully understanding each other (van Rooij, 2003; Gunlogson, 2008; Goodman and Frank, 2016), but also for grounding each other’s assertions in dialogue (Benz, 2006; Stone and Lascarides, 2010). For building intuition for such reasoning, note that a speaker may assert that there’s a strike only if the speaker thinks that the interlocutor doesn’t know that there’s a strike. Reasoning about each other’s information states guides the sort of contributions speakers make. We can build intuition even for (7).

Let’s say there’s a speaker preference between  $a$  and  $\neg a$ . There’s an interlocutor belief about that speaker preference. In light of the contribution that the interlocutor makes, the speaker can reason about the interlocutor’s mental state. The interlocutor may come to believe that the speaker preference does not change in light of their contribution. When the speaker thinks that the interlocutor comes to believe that the speaker preference does not change, *voh hi na* is felicitous to ground the interlocutor contribution. That’s the idea we work with for now, until we make it precise in §4.

Further, we can separate two things in (7). Although it is the ranking as done by the speaker of *voh hi na*, i.e.  $A$  in our examples, that remains unchanged according to  $B$ , the agent whose actions get ranked by  $A$ ’s preferences need not be the speaker. This is especially vivid in the STROLL minimal pair, where the relevant agent is not (just) the speaker. It is both  $A$  and  $B$  who deliberate over taking a stroll in STROLL. In VEGAN, it is just  $A$  who deliberates over a set of actions. Let’s capture this in the observation below.

- (8) **Observation 3:** The agent  $x$  to whom the action set is relativized, as in  $\mathcal{A}_x$ , is contextually determined.

The contextual determination of the agent is not surprising, as the relevant set of actions is contextually determined too.

Although we present our account more fully in §4, another clarificatory remark is in order. Following Kolodny and MacFarlane (2010)’s remark “For in addition to talking of what agents ought to do, we talk of what thinkers ought to believe” (Kolodny and MacFarlane, 2010, page 132), we take believing to be an action too.<sup>10</sup> In other words,

<sup>10</sup>Also see McCready (2008)’s interplay between actions and beliefs within an information state.

we construe *action* broadly so as to include doxastic actions. How does this help? Both of the above contexts were set such that there was a salient action available to at least one discourse agent. Below, we construct a context where an agent is divided on what to believe.

[RAIN]:  $A$  and  $B$  are talking about how it rains so much in San Francisco.  $B$  is under the impression that it’s not raining today. But, it has rained all days of the week, including today. The following exchange occurs.

- (9)  $A$ : It has rained all week.  
 $B$ : Oh, but it’s not raining today. (Takes a peek out of the window.) Oh wait, it is raining.  
 $A$ : Voh hi na.

Now, RAIN is set such that there’s no salient action apart from believing or not that it is raining, and  $A$  and  $B$  are deciding between that. Therefore, what unites all of the contexts so far is rank-preservation over a set of actions, where the conception of *action* includes doxastic actions too.

The contexts so far might give the following impression: that the interlocutor has to update their belief state to align with the speaker’s; and that this alignment makes it felicitous for the speaker to ground the interlocutor’s discourse move with *voh hi na*. This generalization doesn’t hold, and baking this into the semantics for *voh hi na* would under-specify its felicitous uses. Consider the context below.

[HIKE]: It’s raining very heavily.  $A$  had planned to go on the hike, but now  $A$  is put off by the rain. The following exchange occurs between  $A$  and  $B$ .

- (10)  $A$ : I don’t think I’ll go to the hike.  
 $B$ : The trail must be very slippery too today.  
 $A$  (glumly): Voh hi na.

$B$  doesn’t come to update their belief state or preference for an action. All that occurs is that  $B$  says something that validates  $A$ ’s preference for not going to the hike.

Moreover, in (10),  $A$  has no credence or degree of positive belief in the proposition that the trail is very slippery.  $A$  has a preference for an action, and the proposition that the trail must be very slippery preserves  $A$ ’s preference for not going to the hike. The important thing to note is that we cannot make a generalization about speaker’s prior belief about

$p$ , where  $p$  is the proposition which the speaker grounds with *voh hi na*. Prior to interlocutor's assertion of  $p$ , the speaker may have a belief w.r.t.  $p$  or may be agnostic. *Voh hi na*'s felicity doesn't co-vary with a prior belief w.r.t  $p$ .

The above contexts may give the impression that the speaker who grounds a discourse move with *voh hi na* ought to have ranked the set of available actions such that a unique action among the set comes out to be preferred. However, it is quite possible that the current information state of the speaker doesn't break the tie between two alternative actions in the action set. Consider the following context and dialogue.

[PROPOSAL]: A and B are friends, and A is dating Mohan since a year now. A thinks that Mohan will propose to her, but A is divided between whether she should say *yes* or not. Mohan is loving towards A, which A loves, but Mohan is rude towards work staff, which A hates. A expresses this problem to B, and continues by saying,

- (11) A: I'm really not sure about Mohan.  
 B: I get you! He is such a loving guy, but he comes off as super arrogant occasionally. Now, how does one decide?  
 A: Voh hi na.

In the above context, A hasn't made up her mind about Mohan. More specifically, A hasn't made up her mind as to whether she should accept Mohan's proposal or not. It is this indecision that she expresses to B. B's utterance only confirms A's state of indecision. While in contexts like VEGAN, and RAIN, B's assertion confirmed A's *preference* for an action, in PROPOSAL, B's assertion confirms the lack of preference. This illustrates the importance of the way we defined rank-preservation above.

In defining rank-preservation, we said that the speaker ranking for a salient set of alternative actions does not change once the content of the utterance preceding *voh hi na* is made common ground. Now the speaker ranking may be such that two actions acquire the same order in the ranking. This insight informs our formalization, as we would not always want the action set to be strictly ordered.

- (12) **Observation 4:** The contextually determined set of actions need not be strictly ordered for *voh hi na* to be used felicitously.

With all of the above contexts in mind, it may start seeming as if all that *voh hi na* grounds is agreement by the interlocutor. In other words, one can propose that *voh hi na* is felicitous to use only if the prior move expresses agreement with what the speaker of *voh hi na* had said earlier in the discourse. First, such an account would need to employ a rather broad notion of agreement. In (10), B simply adds new information to the common ground, i.e., the trail must be very slippery. This is not how we canonically understand agreement. This can also be noted with other contexts like VEGAN. If such moves by the interlocutor are construed as agreement, they certainly don't target the content of the preceding utterance. For instance, in (10), B, in noting the slipperiness of the trail, doesn't explicitly target the content of *I don't think I'll go to the hike*. In addition, we can construct a dialogue where the interlocutor agrees with the content of what the speaker utters earlier, but to ground with *voh hi na* turns out to be infelicitous. [WEATHER]: A and B are talking about the weather in San Francisco.

- (13) A: The weather here is terrible.  
 B: I agree!  
 A: # Voh hi na.

The infelicity of *voh hi na* in (13) illustrates that its felicity conditions cannot be defined by the following requirement only: that the move it grounds expresses agreement with what the speaker of *voh hi na* had said earlier. It may be that the content of the move by B that *voh hi na* grounds ought to be consistent with what A had said earlier in the discourse. However, that is exactly what we have been trying to work towards: a clear and precise understanding of *the way* in which the prior move is consistent with speaker commitments or preferences that the speaker makes public. To that end, we provide our semantic account below.

## 4 The semantic account

### 4.1 Nuts and bolts

In the previous section, we noted multiple things along the way in light of the contexts. However, we did not list all of them as observations as in observations 1-4. For instance, in light of HIKE and (10), we observed that the interlocutor whose move gets grounded by *voh hi na* need not have updated their belief state. Moreover, due to (10), we also noted that the speaker who grounds with

*voh hi na* need not have a prior degree of positive belief in the proposition that is grounded. The reason for making these notes along the way was to merely point out that these features of the dialogues are orthogonal to the felicitous use of *voh hi na* as a grounding move. Therefore, we didn't highlight these as observations, unlike observations 1-4.

We use observations 1-4 to build our semantic account for *voh hi na*. First, we must get a better understanding of how the four observations are dialectically related to each other. An informal account will fall out of this understanding.

Observation 1 tells us that the speaker of *voh hi na* ought to have made a prior commitment that gets validated by the interlocutor. As is obvious, the notion of prior commitment is underspecified, and the notion of validation is not defined. To specify these two notions in a precise manner, we introduce the notion of an action set. Here, we specify the properties of the action set explicitly.

- (14) An action set  $\mathcal{A}$  has the following properties:
- a.  $\mathcal{A}$  is the set of alternative actions.
  - b.  $\mathcal{A}$  is relativized to an agent  $x$ , as in  $\mathcal{A}_x$ .
  - c. The order on  $\mathcal{A}$  may be weak.
  - d.  $\mathcal{A}$  can include doxastic actions.

The condition of alternative-hood makes  $\mathcal{A}$  such that, for ease, one can divide up the action space to include two mutually exclusive actions, along with (an optional) third catch-all OTHER category.<sup>11</sup> This can especially help in formalization. Secondly, the agent-relativization is contextually determined. While in VEGAN,  $\mathcal{A}$  is relativized only to A, in STROLL,  $\mathcal{A}$  is relativized to both A and B.<sup>12</sup> Here, we don't probe the mechanisms of context-sensitivity involved in determining  $\mathcal{A}$ . We make the simplifying assumption that a context and a dialogue will provide such a salient  $\mathcal{A}$ , which will be relativized to an agent. This assumption relies on the dialogue agents' ability to infer such a set. If such an inference is not made and an action set isn't available, our theory predicts that *voh hi na* cannot

<sup>11</sup>This is indeed what Cariani (2013) does. For the most part, we ignore the OTHER.

<sup>12</sup>There's a wide variety of context-sensitive expressions in language (Kaplan, 1979; Lewis, 1981; Kratzer, 1981; Laserohn, 2005; Stephenson, 2007; MacFarlane, 2014; Jabbar, 2021). Moreover, there's recent work that aims to specify more quantitatively effects of context-dependence for semantic interpretation and pragmatic inference (Beddor and Egan, 2018; Kursat and Degen, 2020)

be used as a grounding move. Further, we note that the order on  $\mathcal{A}$  may be weak. This amounts to the feature that an agent can have an absence of preference for two actions in the set. This is illustrated nicely in PROPOSAL/(11). And lastly, we construed *action* to include doxastic actions too.

Note that Observation 3 and 4 fall out of making the notion of action set precise, as in (14-b) and (14-c). Moreover, in §3, Observation 2 was presented as a precisification of Observation 1. In turn, Observation 2 makes reference to  $\mathcal{A}$  and Observation 3 and 4 define features of  $\mathcal{A}$ . That's how all of the observations are dialectically related. Here, we transmute Observation 2 to a semantic account of *voh hi na*.

- (15) Statement: A speaker  $s$  can felicitously ground  $u$ , as said by an interlocutor, with *voh hi na* only if, given a contextually determined  $\mathcal{A}$ , (i) the speaker ranking  $\prec$  over  $\mathcal{A}$  is public; (ii)  $s$  thinks that, according to the interlocutor,  $\prec$  remains unchanged when  $\llbracket u \rrbracket$  is made common ground.<sup>13</sup>

There are many things to be made precise here. First, we need a notion of publicity of preferences. Second, although we talked about how the discourse participants can reason about each other's information states, we face the challenge of implementing this formally. And thirdly, we haven't said anything about what it means for the ranking to be unchanged. We take on these tasks in the next section and present a formal model.

## 4.2 The formal model

We use Cariani (2013)'s influential work on deontic modals to couch our account above in an intensional semantics framework.<sup>14</sup> We construe action-types as sets of worlds. More specifically, we can think of actions as functions from agents to sets of worlds. For instance, A's going to the hike can be modeled as the action type *going to the hike* taking A as an argument and yielding the set of worlds where A goes to the hike. As at a given time, an agent can either go to the hike or not, the set of alternative actions specifies a partition over the logical space. This partition divides the logical space such that worlds  $w$  and  $v$  occupy the same cell in the partition if and only if the agent performs that same action in  $w$  and  $v$ . Before things start to

<sup>13</sup>For any utterance  $u$ , we take  $\llbracket u \rrbracket$  to be its content.

<sup>14</sup>Cariani in turn cites Belnap et al. (2001) as inspiration.

get any more wordy, let's start formalizing.

Where  $W$  is the set of all worlds and  $\Gamma W$  is an equivalence class over  $W$ , we can define the set  $\mathcal{O}_x$  for an agent  $x$  as the following equivalence class using an action set  $\mathcal{A}$ :

$$(16) \quad \mathcal{O}_x = \Gamma W \text{ s.t. for } \gamma \in \Gamma W, w \in \gamma \text{ and } v \in \gamma \text{ iff } w \in a(x) \text{ and } v \in a(x), \text{ where } a \in \mathcal{A}$$

In words and more simply,  $\mathcal{O}_x$  is the appropriate equivalence class over worlds as specified by action-types taking agents to propositions, where action-types are provided by a contextually determined action-set.

We can certainly rank worlds in the Kratzerian (Kratzer, 1981, 2012) fashion by ordering sources. However, given that *voh hi na*'s felicity tracks preference over a set of actions, following Cariani, we rank the cells of  $\mathcal{O}_x$ . More importantly, we let this ranking be provided by the preferences of the speaker of *voh hi na* (A in our dialogues). This is what we have been calling *speaker-ranking* all along. We can state this more explicitly below.

$$(17) \quad \prec \text{ is the ordering over } \mathcal{O}$$

We can relativize  $\prec$  to an agent  $x$  as in  $\prec_x$  to represent  $x$ 's preferences over  $\mathcal{O}$ . In addition to  $\prec$ ,  $\mathcal{O}$  can be relativized to an agent too. However, our model only bakes in relativization of  $\prec$  to specific agents. Although  $\mathcal{O}$  will be relativized to (a group of) agents too, who these agents are will be contextually determined. In VEGAN, it is the speaker. In STROLL, it is both the speaker and the interlocutor. This relativization will be contextually determined.

Below, we can show how preferences over an action-set can be lifted to preferences over a partition  $\mathcal{O}$ . In (19), we also define the identity relation for preferences, which we use later.

$$(18) \quad \text{For } \sigma, \tau \in \mathcal{O}, \sigma \prec_x \tau \text{ iff } x \text{ prefers } a_1 \text{ over } a_2 \text{ and } a_1(x) = \sigma \text{ and } a_2(x) = \tau$$

$$(19) \quad \prec_1 = \prec_2 \text{ iff for } \sigma, \tau \in \mathcal{O}, \sigma \prec_1 \tau \text{ and } \sigma \prec_2 \tau$$

Moreover, following work in discourse structure and dynamic semantics, we take each discourse participant to be associated with an information state.<sup>15</sup> Discourse moves can be analyzed by their

<sup>15</sup>Stalnaker (1978) first models the effect on an assertion as an intersective update on the context set. We use just that notion of update and remain agnostic about the sense in which

effects on information states. Where  $p$  is a proposition and  $s$  an information state, we denote update by the following notation:

$$(20) \quad s[p]$$

The dynamic effect of such an update can be modeled as:

$$(21) \quad s[p] = \{w \in s \mid p(w) = 1\}$$

We can take  $\prec$  to be sensitive to  $s_x$ ,  $x$ 's information state. This sensitivity can be denoted by  $\prec_{s_x}$ . The thought behind this sensitivity is simple; your preferences are determined by what you think the world is like. If you believe that it is raining, you may bring your umbrella with you. Moreover, in §3, we noted that participants reason about each other's mental states in dialogue. Specifically, (ii) in (15) states that the speaker thinks that, according to the interlocutor, the speaker preference remains unchanged. To be able to implement such reasoning about mental states, we introduce the interlocutor's construction of the speaker information state. While for the speaker  $x$ , we denote  $x$ 's state by  $s_x$ , the interlocutor's construction of it is denoted by  $s_x^i$ .  $s_x^i$  will not always be an accurate construction of  $s_x$ .

Preferences aren't just sensitive to information states, but crucially to subjects too, as we noted in our discussion of (17). For modeling purposes, one might suggest that preferences come out to be sensitive to subjects by way of being sensitive to their information states. However, such a trickle-down is not ideal. Why not? Given the interlocutor's construction of a speaker's information state  $s_x^i$ , we are left with the choice of whether the relativization to the subject should trickle down from  $s_x^i$  to  $i$  or  $x$ . We see no *prima facie* reason for trickle-down to  $i$  over  $x$ , or *vice versa*. Therefore, for modeling purposes, we let  $\prec$  be sensitive to two parameters: an information state and a subject. For instance,  $\prec_{x, s_x^i}$  denotes  $x$ 's preferences given  $i$ 's construction of  $x$ 's information state. This is to model  $x$ 's preferences from the interlocutor's perspective. To illustrate with an example, it's quite possible that B doesn't know that A is vegan. In such a scenario, B may think that *there's a really nice burger-place in the south end of campus* is such that once A's information state updated with its content, A would want to eat on campus. This is a case where the agent for the  $\mathcal{O}$  is A.  $\prec_A$  over  $\mathcal{O}_A$  is also sensitive it is dynamic (Rothschild and Yalcin, 2016).

to A in modeling A’s ranking over  $\mathcal{O}_A$ . Moreover  $\prec$  here is sensitive to B’s construction of A’s information state, which is inaccurate in not taking into account that A is vegan, which is a crucial piece of information for A that determines  $\prec_A$ .

In addition to individual information states, there’s a scoreboard that all discourse participants contribute to. More theoretically, this is termed *the common ground*, call it *cg* for short. *cg* simply contains all of the propositions that are public knowledge.<sup>16</sup> Stalnaker’s formalization of *cg*, the context set, is achieved by set intersection of all of the propositions in *cg*. We introduce *cg* to model the publicity of speaker preference in discourse. We noted this as a requirement for the felicity of *voh hi na* in (15). As we know from Stalnaker (1978), when a proposition *p* gets added to *cg*, more than *p* is added to *cg*, including the proposition that *p* has been added to *cg*. Similarly, we can let the following be a proposition: that *x* has the preference  $\prec_{x,s_x}$  over a set of actions  $\mathcal{A}$ . This proposition is separate from the preference itself. If this proposition is *cg*, then we can say that *x*’s preferences w.r.t.  $\mathcal{A}$  are public. More explicitly:

- (22) *x*’s preferences w.r.t.  $\mathcal{A}$  are public iff the proposition that *x*’s preferences over  $\mathcal{A}$  are provided by the order  $\prec_{x,s_x}$  is common ground.

The above way of modeling the preference being public helps to keep the model simple. Note that while it may be public that *x*’s preferences are provided by  $\prec_{x,s_x}$ , the information state *s* may still be private to *x*. You can refrain from eating meat due to your belief that the meat is contaminated; let it be public that you don’t want to eat meat, while keeping private your belief about its contamination.

If we take  $\llbracket u \rrbracket$ , the content of the utterance *u* that *voh hi na* grounds, to be the antecedent for *voh*, we can take *hi na* to be operating on  $\llbracket u \rrbracket$ . Where  $p = \llbracket u \rrbracket$ , *x* and *i* are the speaker and interlocutor respectively, and  $\mathcal{O}$  is formed via a contextually supplied  $\mathcal{A}$ ,

- (23) *voh hi na* can felicitously ground *u* only if for  $\prec_{x,s_x}$  and  $\prec_{x,s_x^i}$  over  $\mathcal{O}$ , *x* believes that<sup>17</sup>

- a.  $\prec_{x,s_x}$  is public  
b.  $\prec_{x,s_x} = \prec_{x,s_x^i}[p]$

First, note crucially that in (23), both (23-a) and (23-b) are stated in the scope of what *x* believes. Therefore (23) boils down to the following: (i) the speaker believing that for a salient action, the speaker’s preferences w.r.t. it are public; (ii) the speaker believing that the speaker ranking over the action set, given what the speaker knows, is the same as the speaker ranking over the salient action set given what the interlocutor thinks the speaker knows once updated with the interlocutor’s contribution. Let’s understand (23) even more vividly. Using the two conditions in (23), we walk the reader through two full calculations below.

## 5 Explaining *voh hi na*

Given that in all our dialogues, A grounds with *voh hi na* and B is the interlocutor, we use  $s_A$  to denote the speaker information state and  $s_A^B$  for the interlocutor’s construction of  $s_A$ . Now, we can use our model above to explain the dialogues we presented in §3. First, we take STROLL 1 and 2. In STROLL 1, use of *voh hi na* is felicitous, while in STROLL 2, it isn’t. In STROLL 1, A’s preference for believing that it’s raining is made public by A’s utterance *You’re being optimistic. It’s probably raining outside*. In STROLL 2, there’s nothing as such made public. Our account, more specifically (23-a), explains this distribution. Now, the difference in *voh hi na*’s felicitous use in VEGAN and NOT VEGAN can be explained using (23-b). Let’s walk through this calculation carefully.

- (24) a. The contextually salient action-set is  $\{eat\ on\ campus, not\ eat\ on\ campus\}$ .<sup>18</sup>  
b. Both VEGAN and NOT VEGAN are set such that *not eating on campus*  $\prec_{A,s_A}$  *eating on campus*. This means that A ranks not eating on campus higher than eating on campus.  
c. In NOT VEGAN, B asserts that there’s a really nice burger place in the south end. Call this proposition *nice burger*.  
d. Once  $s_A^B$ —what the interlocutor thinks the speaker information state

<sup>16</sup>To define and even understand common ground is not an easy task. See Lederman (2018) for why the classical ways of understanding common ground may be inaccurate.

<sup>17</sup>We add *x believes that* because it is *x* who reasons about the interlocutor’s contribution and grounds it.

<sup>18</sup>Alternatively, we can say that the action set in VEGAN and NOT VEGAN contains *believing that there’s no good food on campus* and *believing that there is good food on campus*. Every set containing actions can be reduced to a set containing doxastic actions.



is—is updated with *nice burger*,  $\prec_{A,s_A^B}$ —the speaker ranking, given  $s_A^B$ , for what the speaker does—is such that *eating on campus*  $\prec_{A,s_A^B}$  *not eating on campus*.

We note in §3 that this action-guiding potential of *nice burger* is what serves as motivation for B to assert *nice burger*.

- e. Given (24-b), (24-d), and the identity conditions for any two  $\prec$  (cf. (19)),  $\prec_{A,s_A} \neq \prec_{A,s_A^B}[\textit{nice burger}]$ .

Via (24-e), we witness a direct violation of one of the conditions for felicitous use of *voh hi na*, as outlined in (23-b). Thus, our account correctly predicts that *voh hi na*'s use to ground *nice burger* would be infelicitous in NOT VEGAN. We get the same calculation for RAIN, HIKE, and PROPOSAL. In RAIN, the preference for believing that it is raining is reified. In HIKE, the preference for not going to the hike is preserved. In PROPOSAL, the state of indecision survives a tie. Each of these contexts differs from each other in some way. Then, (23)'s ability to explain these contexts at least suggests that our model specifies felicitous uses of *voh hi na* at the right amount of fit.

## 6 Conclusion

In this paper, we have presented one way of thinking about a grounding move. Our inquiry was guided by the following observations. There's an utterance that ought to have been made prior to *voh hi na*. *voh hi na* itself involves a pronoun *voh*. We made the safest assumption that the proposition expressed by the prior utterance serves as the antecedent proposition for *voh*. This led us to analyze the two appended particles in a non-compositional way where we understood the contribution of *hi na* as establishing a relation between the antecedent proposition and a feature of the discourse structure. Given that we didn't decompose *hi na*, our account comes out to be partly compositional. Although the current account explains the data presented, a more complete account will seek to derive the meaning contribution of (23) entirely compositionally. This will give us a nice insight into how meanings of multiple discourse particles can compose with each other. Such a line of inquiry is exciting also because we can infix another particle *toh* to form *voh hi toh na*. It would be interesting to see if the fe-

licitous distributions of *voh hi na* and *voh hi toh na* vary, which can help us understand discourse particles better, especially the infix *toh*. Ideally, a compositional account for *voh hi na* would propose individual meanings for particles that don't diverge too much from the ones proposed in the literature already. In the other direction, semantic accounts of particles in the literature can be tested against their ability to derive the felicitous distribution of *voh hi na*. On the theoretical side, our paper adds to the body of work on linguistic expressions that are sensitive to decision-problems in context. In this vein, our work is most comparable to Davis (2009)'s work on the Japanese discourse particle *yo*.

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