

Graded possibility: Distinguishing epistemic modals in Atayal

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Under possible worlds semantics and Kratzer's (1991, 2012) theory of modality, modals encode existential or universal quantification over a set of worlds evaluated from the actual worlds. This picture however has been criticized to be too simplistic in consideration of the so-called graded modals such as *probably*, *more likely than*, *a good/slight possibility*, etc. (Yalcin 2007; Portner 2009; Lassiter 2011; Kratzer 2012; a.o.) and a typology of modals without duals (Rullmann et al. 2008; Peterson 2009; Deal 2011; Cable 2017). This paper addresses intermediate quantificational strength of modals, drawing evidence from Atayal (Formosan, Austronesian). The modals *ki'a* and *hazi'* in Atayal are shown to be unambiguous epistemic possibility modals that do not encode a difference in the source of evidence. I argue that the epistemic modals lexically encode degrees of possibility and present a proposal couched in Kratzer's theory. Different from gradable modality with overt degree modifiers or comparatives, the Atayal epistemic modals reveal a case of lexical gradability.

Evidence for possibility strength and epistemic modality. While *ki'a* and *hazi'* belong to different grammatical categories, *ki'a* being an auxiliary and *hazi'* an adverb, both modals are lexicalized as epistemic possibility modals. They are compatible with contexts targeting epistemic possibility modality (1) but infelicitous in contexts of non-epistemic possibility (e.g., deontic in (2)); they are also unaccepted in epistemic necessity contexts (3).

(1) *You're going to grab your persimmons in the backyard but they are gone. You wonder:*

- a. **ki'a** wal gal-un ni Ciwas. b. **hazi'** wal gal-un ni Ciwas.
EPIS.POS PRF take-PV ERG Ciwas EPIS.POS PRF take-PV ERG Ciwas
'Ciwas might have taken them.' 'Ciwas might have taken them.'

[Comment: You just say it.]

[Perhaps only you and Ciwas know the place.]

(2) Context: *Your child asks your permission to go out. You say:*

- {#**ki'a**=su' m-usa' / #**hazi'** m-usa'=su' / **nway**=su'} g<m>naw.
EPIST.POS=2SG.ABS AV-go EPIST.POS AV-go=2SG.ABS DEON.POS=2SG.ABS play<AV>
'You might go to play.'

(3) Context: *Rimuy told you that she was very sleepy and would go upstairs to sleep. After a while, you couldn't hear any sound from upstairs. You think, "She must be asleep."*

- (#**ki'a** / #**hazi'**) cyux mk-sngya' m-'abi' la.
EPIS.POS PROG.DIST DESL.AV-ventilate AV-sleep PRT

'She must be deeply asleep.' [Comment: No, *ki'a/hazi'* is 'maybe'.]

No encoding of evidential distinctions. *ki'a* and *hazi'* are sometimes described to encode the speaker's source of evidence, i.e., evidentials; however, a careful examination shows that they do not differ in encoding a particular type of information source. Data will be presented that in context compatible only with inference from reasoning (e.g., (1)) or inference from sensory evidence for the result of the described event, both modals are accepted.

hazi' is stronger than ki'a. In contexts that call for epistemic possibility modals, either *ki'a* or *hazi'* is volunteered, and both modals can also co-occur. However, minimal pairs of *ki'a* and *hazi'* sentences are often accompanied with comments that *ki'a* expresses a weaker claim; witness (1) and (4).

(4) Context: *You ask grandpa, "How many houses are there in the tribe?". He replies:*

- hazi'** kbhul msyaw kwara' cin-ngasal=nya'.
EPIST.POS hundred rest all POSS-house=3SG.GEN

'There might be more than a hundred houses.' [Switching to **ki'a**: You are less sure.]

Furthermore, *hazi'* but not *ki'a* is given in contexts with finer evidence (or those describing better knowledge of the speaker) (5) vs. (6).

- (5) *ki'a* cyux... (6) *hazi'* cyux mk-sngya' m-'abi' la.
 EPIST.POS PROG.DIST EPIST.POS PROG.DIST want-ventilate.AV AV-sleep PRT
 'She might be deeply ...' 'She is probably deeply asleep.'
 [It's your conjecture.] [Context offered: You go to check and she looks asleep.]

Lastly, in future contexts involving an anticipated event, *ki'a* is judged infelicitous; compare (7) and (8). Intuitively speaking, anticipation of events reflects a higher possibility of its realization.

(7) Context: *After the dinner, mother tells you to not clean the dishes:*

- {# *ki'a* / *hazi'* } p-qaniq na' yaba'=su' kira'.
 EPIS.POS FUT.AV-eat still father=2S.GEN later.today
 'Your father will probably still eat later.'

(8) Context: *Your family is having dinner except for your father. Your mother says:*

- {*hazi'* / *ki'a*} p-qaniq na' yaba'=su' kira'.
 EPIST.POS FUT.AV-eat still father=2SG.GEN later.today
 'He might eat later.'

Analysis. Kratzer's semantics utilizes a set of propositions, ordering source, to rank a set of accessible worlds in view of facts in the actual world (i.e., modal base). In epistemically accessible worlds, OS represents a notion of normalcy or stereotypicality: given a normal course of events, some worlds are better than others. Against this background, I propose that while both modals denote an existential quantifier and presuppose an epistemic modal base, *ki'a* minimally differs from *hazi'* in specifying an empty ordering source, as in (9) vs. (10).

(9) $\llbracket ki'a \rrbracket^{g,c}$ is only defined if $c(f)$ is an epistemic MB and $c(h)$ is an *empty OS*.

If defined, $\llbracket ki'a \rrbracket^{g,c} = \lambda f. \lambda h. \lambda P. \lambda t. \lambda w. \exists w' [w' \in \text{BEST}_{h(w,t)} (\cap f(w,t)) \& P(w')(t) = 1]$

(10) $\llbracket hazi' \rrbracket^{g,c}$ is only defined if $c(f)$ is an epistemic MB.

If defined, $\llbracket hazi' \rrbracket^{g,c} = \lambda f. \lambda h. \lambda P. \lambda t. \lambda w. \exists w' [w' \in \text{BEST}_{h(t,w)} (\cap f(t,w)) \& P(w')(t) = 1]$

(9) says that p is true in some of the accessible worlds; the worlds compatible with the modal base are equivalently good, given no identification of an ideal and no ranking is imposed on the accessible worlds. This gives the widest domain of quantification (akin to Kratzer's Simple Possibility). In (10), *hazi'* does not presuppose that its ordering source is empty or non-empty, simply leaving it open to be determined by what is salient in the context.

The fact that *hazi'* is stronger than *ki'a* can be attributed to pragmatic competition between the modals without involving an extra specification in the lexical meaning of *hazi'*. Since *ki'a* has a presupposition of an empty OS, it is chosen whenever the presupposition is met. Although the semantics of *hazi'* is compatible with both the weakest and slightly stronger possibility strength, the weakest reading is predicted to be blocked by *ki'a* based on Maximize Presupposition (cf. Heim 1991). The proposed semantics of *hazi'* and *ki'a* correctly predicts that in contexts in which a modal claim is supplied by more evidence or is more grounded, which involve a smaller domain of accessible worlds, *hazi'* is appropriate whereas *ki'a* is not. Moreover, since the strength of *hazi'* entails that of *ki'a*, Grice's Maxim of Quantity predicts that the choice of *ki'a* over *hazi'* incurs an implicature that the speaker is not in a position to make a stronger commitment to the truth of p . I suggest this analysis is superior to one in which *hazi'* presupposes a non-empty OS, as *hazi'* and *ki'a* are both volunteered forms of epistemic possibility when the context involves no strength contrast.

Overall, the Atayal epistemic modals present a typologically unique case: while they are comparable to modals with variable strength, argued to depend on the role of ordering source (as in Peterson 2009), the gradability of Atayal modals is lower bound within the domain of possibility. This raises an interesting question what conditions that a (stronger) possibility modal can be used in necessity contexts in one language but not in another.