# Variable force modality in Washo*

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## 1. Introduction

This paper contributes to a recent and growing body of literature concerning the analysis of apparently variable force modals across languages. The modal verb *-eʔ* in Washo (Hokan/isolate; USA) is such a modal: it is compatible with both necessity and possibility readings, and is furthermore underspecified for modality type/flavor. Examples (1)-(4) show necessity and possibility readings for epistemic and deontic modalities; see Bochnak (2014) for examples with other modal flavors.[1]

(1) a. Context: You are planning to drive over the mountains. It has started to snow, and you know that whenever it snows, the road over the mountains is closed.

b. déʔeš-ʔáŋaw-i-š yéweš gum-beyéc'ig-i-gi **k'-éʔ-i**
snow-good-IND-SR road REFL-close-IND-REL 3-MOD-IND
'It's snowing a lot, so the road must be closed.' EPISTEMIC NECESSITY

(2) a. Context: You hear a knock at the door. You can't see through the window who it is, and you're not expecting anyone, but you can make out that the person looks about the same height as Beverly.

b. bévali k'-éʔ-hel-i-gi **k'-éʔ-i**
Beverly 3-be-SUBJ-IND-REL 3-MOD-IND
'It might be Beverly.' EPISTEMIC POSSIBILITY

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[1]Unless otherwise stated, the data used in this paper come from my own primary fieldwork. I use the following morpheme glosses for the Washo data: 1/2/3 = 1st/2nd/3rd person; CAUSative; FUTure; INDependent mood; LOCative; MODal; NC = negative concord; NEGation; NMLZ = nominalizer; Question; REFLexive; RELative clause marker; SR = switch reference; SUBJunctive. Characters in Washo orthography (adapted from Jacobsen 1964) not conforming to their typical IPA values are as follows: L = [l̥]; š = [ʃ]; y = [j].

(3) a. Context: A friend comes to visit, and brings her dog along. You don't want the dog to come inside.

b. súku baŋáya ʔ-éʔ-i-š-gi **k'-éʔ-i**
dog outside 3-be-IND-SR-REL 3-MOD-IND
'The dog has to stay outside.' DEONTIC NECESSITY

(4) a. Context: Mary's friends come over to ask her to come play. She isn't allowed, because she hasn't finished all her chores. Later, her friends return.

b. wádiŋ hé:š ʔum-p'áyt'iʔ-giš-uweʔ **k'-éʔ-i**
now Q 2-play-along-hence 3-MOD-IND
'Now are you allowed to come play?' DEONTIC POSSIBILITY

This behavior makes the modal *-eʔ* look similar to modals with variable force effects found in other languages (Deal 2011 for Nez Perce; Matthewson 2013 and Peterson 2010 for Gitksan; Rullmann et al. 2008 for St'át'imcets; Yanovich 2013 for Old and Middle English). There are two major classes of analyses[2] for such phenomena found in the literature: (**A**) they are necessity modals, which can be subject to weakening to derive the apparent possibility readings; (**B**) they are possibility modals, which can be strengthened to derive the apparent necessity readings. While Rullmann et al. (2008) argue for option **A** for St'át'imcets modals, all subsequent authors have opted for **B**, casting doubt on whether **A** is in fact an option for natural language.

In this paper, I argue that Washo *-eʔ* is a necessity modal that can be weakened, providing cross-linguistic evidence for option **A**. Evidence comes from the behavior of *-eʔ* in downward-entailing environments, where both necessity and possibility readings are available. Indirect evidence comes from conditionals and generics, which are both environments that have been argued to involve silent operators encoding universal quantification, and where *-eʔ* appears obligatorily. My analysis aims to capture the behavior of *-eʔ* in these environments by making use of a double quantification structure inspired by Deo's (2009) partition-based account of imperfectives. Roughly: in all cells of a contextually-determined partition of accessible worlds, there exists a world where the prejacent proposition is true.

## 2. Downward entailing environments

As argued by Deal (2011), the most direct evidence for analysis **B** of variable force effects comes from the behavior of a modal in downward-entailing (DE) contexts. The argument is as follows. In upward-entailing (UE) environments, a possibility modal is in principle compatible with necessity, and in the absence of a lexical necessity modal (i.e., a stronger alternative), a possibility modal can seemingly have the effect of having variably weak or strong force. In DE environments, however, the scalar strength of quantifiers is reversed, and possibility is no longer compatible with necessity. Thus, if a modal with apparent

[2]These analyses all make use of a Kratzerian quantificational analysis for modals (Kratzer 1981, 2012), which I assume familiarity with.

variable force in UE contexts is only compatible with possibility in DE contexts, as is the case in Nez Perce, this is good evidence for analysis **B** for that modal.

In Washo, syntactic restrictions prevent *-eʔ* from scoping under negation (verbal suffix *-éːs*), as shown in (5)-(6), making this test inconclusive.[3]

(5) a. Context: Someone offers you some candy, but your doctor says it's unhealthy.

b. demuc'úc'u-ŋa le-iʔiw **-éːs** -i-š-gi **k'-eʔ-i**
sweets-NC 1-eat-NEG-IND-SR-REL 3-MOD-IND
'I shouldn't eat candy.'

c. *demuc'úc'u-ŋa le-iʔiw-i-š-gi **k'-eʔ -éːs -i**
sweets-NC 1-eat-IND-SR-REL 3-MOD-NEG-IND

(6) a. Context: We are discussing the weather for tomorrow. The weather report says there is a chance of rain, but they're often wrong, so it may or may not rain tomorrow.

b. wát háʔaš **-éːs** -gab-i-gi **k'-eʔ-i**
tomorrow rain-NEG-FUT-IND-REL 3-MOD-IND
'It might not rain tomorrow.'

c. *wát háʔaš-gab-i-gi **k'-eʔ -éːs -i**
tomorrow rain-FUT-IND-REL 3-MOD-NEG-IND

However, a DE environment where we can embed *-eʔ* is in conditional antecedents.[4] To show the results of this test, I first show how conditionals are formed in Washo.

Conditionals in Washo lack specialized morphology corresponding to *if* and *then*. The antecedent is not marked with any overt morphology, whereas the main clause occurs in a form identical to the modal statements we have already considered. Taking (7) as an example, the antecedent clause *déʔešʔáŋawiš* 'if it is snowing' is morphologically 'unmarked', while the main clause *yéweš gumbeyéc'igigi k'éʔi* obligatorily contains an occurrence of the modal verb *-eʔ* (i.e., 'the road must be closed').[5]

(7) a. Context: We're wondering under which conditions the road to the lake is closed.

b. déʔeš-ʔáŋaw-i-š yéweš gum-beyéc'ig-i-gi **k'-éʔ-i**
snow-good-IND-SR road REFL-close-IND-REL 3-MOD-IND
'If it's snowing a lot, then the road is closed.'

Like other modal statements involving *-eʔ*, conditionals can receive necessity or possibility interpretations, depending on the context; see (8)-(9).

[3] Interestingly, this is also observed for modals in St'át'imcets, the other language which is argued to make use of option **A** (Rullmann et al. 2008).

[4] See, however, von Fintel (2001) on the non-monotonicity of conditional antecedents.

[5] Note that (7) is string-identical to (1).

(8) a. Context: We're wondering whether Steven will come to the party. You hope he comes.

b. ʔ-íːbiʔ-i-š ʔáŋaw-i-š-gi **k'-éʔ-i**
3-come-IND-SR good-IND-SR-REL 3-MOD-IND
'If he comes, that would be good.'

(9) a. Context: We're discussing our plans for tomorrow.

b. wayák'aš-i-š dáʔaw ʔáːgaʔ-a le-iyeʔ-uweʔ-gab-i-gi **L-éʔ-i**
warm-IND-SR Lake Tahoe-LOC 1-go-hence-FUT-IND-REL 1-MOD-IND
'If it's warm, we will/might go to Lake Tahoe.'

Interestingly, this distribution of *-eʔ* can be straightforwardly accounted for by the restrictor analysis of conditionals, whereby *if* clauses are overt restrictors of a necessity modal (Kratzer 1986, 2012). What we see in (7)-(9) is that the modal that is proposed to be covert in conditionals in languages like English is in fact overt in Washo. That is, the antecedent clause is the restrictor of the modal *-eʔ* in Washo conditionals. Given that the covert modal in conditionals in other languages is proposed to be a necessity modal on independent grounds, this provides indirect evidence that *-eʔ* is a necessity modal.

With this background in place, we can now test the interpretation of the modal *-eʔ* in the antecedent clause. As observed in (10), a modal in the antecedent is compatible with either a necessity or possibility interpretation, depending on the context.

(10) a. Context A: You really don't want a dog; you would prefer a cat. But if your family was making you buy a dog rather than a cat, then you would want to have a big one.
Context B: We are talking about what kinds of pets we would like to own, assuming that our families would let us get one.

b. súku di-begúweʔ **k'-éʔ-i**-š t'íːyeliʔ di-begúweʔ **k'-éʔ-i**
dog 1-buy 3-MOD-IND-SR big 1-buy 3-MOD-IND
'If I {A: have to / B: am allowed to} buy a dog, I will buy a big one.'

This result provides evidence in favor of option **A** for the analysis of the modal *-eʔ*, since option **B** predicts that a possibility modal in a DE context is incompatible with a necessity interpretation. That is, the data provide evidence for the treatment of *-eʔ* as a necessity modal that can be weakened, rather than a possibility modal that can be strengthened in UE contexts.

## 3. Generic statements

We have already seen the use of *-eʔ* in conditionals in examples (7)-(10). Another environment where *-eʔ* occurs is with generic statements (Bochnak et al. 2011).[6] Compare

[6]In these cases, *-eʔ* embeds a constituent smaller than a full clause; see (Bochnak et al. 2011).

the generic statement in (11), which contains an instance of *-eʔ* and occurs with the adverb *míʔleʔ guweʔéːbeyi* 'every day', with the episodic statement in (12) with the adverb *wáːdiŋ* 'now', but without *-eʔ*. Kind generics also involve *-eʔ*; compare the kind generic in (13) with the corresponding episodic sentence in (14).

(11) Ramona wálaš da-dóːdaʔ **k'-éʔ-i** míʔleʔ guweʔéːbeyi
Ramona bread NMLZ-make 3-MOD-IND every day
'Ramona makes bread every day.'

(12) wáːdiŋ Ramona wáːlaš dóːdaʔ-i
now Ramona bread make-IND
'Ramona is making bread now.'

(13) géwe t'áːnu-ŋa t'-iʔiw-éːs **k'-éʔ-i**
coyote person-NC NMLZ-eat-NEG 3-MOD-IND
'Coyotes don't eat people.'

(14) géwe t'ánu-ŋa ʔ-iʔiw-éːs-i
coyote person-NC 3-eat-NEG-IND
'The coyote isn't eating anybody.'

It is common to treat generics (in English and other languages) as involving quantification via a covert generic operator (Krifka et al. 1995). Specifically, such an operator is usually taken to involve universal quantification over events of a certain type, or over instantiations of a kind, within some contextually determined domain restriction. While much more work needs to be done on the landscape of generic statements in Washo, the fact that *-eʔ* is used in this environment where universal quantification has independently been argued to be at issue is certainly suggestive.

Notably, one of the challenges of the universal quantification analysis of generics is the fact that in many contexts, the quantification appears to have a force that is much weaker than universal. For instance, generics are well-known for tolerating exceptions, and in some cases the quantification can even be so weak as to have an existential flavor. This is also the case in Washo generic statements in *-eʔ*. For instance, (15) shows that exceptions are tolerated, and (16) is a case where the quantification involves appears to be (near-)existential.

(15) stívɨn da-báŋkuš **k'-éʔ-i**-ŋa wádiŋ baŋkuš-éːs-i
Steven NMLZ-smoke 3-MOD-IND-but now smoke-NEG-IND
'Steven smokes, but he's not smoking right now.'

(16) a. Context: A friend is having a dinner party and wants know if anyone is a vegetarian. I don't really eat meat that often, but I'm not a vegetarian.

b. ʔádaš t'-íʔiw **L-éʔ-i**
meat NMLZ-eat 1-MOD-IND

'I eat meat.' Speaker's comment: "Could be once in a while"

Generic statements in Washo thus appear to have the same range of interpretations as those in English. Of interest here is the fact that *-eʔ* is present overtly where a covert universal-like operator is proposed to be at work in English. Such a finding is significant for two reasons. First, it provides further indirect evidence for the status of *-eʔ* as a necessity operator. Second, given that the modal *-eʔ* has variable force effects in other environments in which it appears, the fact that generic statements also display variable force effects potentially provides an interesting clue regarding the proper analysis of generics in general, though I must leave this question for future work.

## 4. Subjunctive morphology

An interesting set of data consistent with the idea that *-eʔ* is a necessity modal whose force can be weakened involves the verbal suffix *-hel*, which Jacobsen (1964) glosses as 'subjunctive.' This morpheme is unlike more familiar Indo-European subjunctives which are typically selected for by certain attitude verbs; rather, *-hel* must co-occur with the modal *-eʔ*, and when it does, it forces a weaker reading of the modal. Observe that in (17) and (18), necessity readings of the modal are not possible.

(17) a. Context: You've been working on fixing the house for a while now. It's almost done, but you're not sure if you'll be able to finish it by tomorrow.

b. wát di-dó:da-máma?-**hel**-i-š-gi **k'-éʔ-i**
tomorrow 1-work-finish-SUBJ-IND-SR-REL 3-MOD-IND
'I might finish it tomorrow.' /#'I will finish it tomorrow.'
Speaker's comment: 'It sounds like you're guessing.'

(18) a. You see someone trying to pick up a very heavy rock. You are very strong, so you think you can pick up that rock.

b. déʔek há:digi di-bípis-**hel**-i-š-gi **k'-éʔ-i**
rock that 1-pick.up-SUBJ-IND-SR-REL 3-MOD-IND
'I can lift that rock.' (#'I have to lift that rock.' / #'I will lift that rock.')

This behavior is reminiscent of subjective morphology in St'át'imcets, which also has the function of forcing a weak reading of a modal that otherwise has variable force readings (Matthewson 2010). While I cannot go into the details of Matthewson's analysis for reasons of space, the functional effect of subjunctive morphology on her account is that it weakens the quantificational force of a modal that has the force of necessity. Understood in this way, we can also view subjunctive *-hel* in Washo as weakening the force of the necessity modal *-eʔ*. Note, however, that *-hel* is not required for obtaining a weak reading of *-eʔ*; see (4), (6), (9), (10).

## 5. Analysis

In my analysis of the modal *-e?*, I would like to account for its variable force effects, as well as the fact that it occurs in both modal contexts as well as generics. The analysis I propose is inspired by Deo's (2009) analysis for imperfectives, which also seeks to address variable force effects, i.e., variability in the frequency of events to make an imperfective statement true. Under her analysis, an imperfective-marked sentence is true if the reference time is a non-final sub-interval of a time interval which is divided into a contextually determined regular partition. Then, an imperfective-marked sentence comes out true if, for each cell in the partition, there is an event of the type named by the vP that coincides with that time interval. The formal definition of a regular partition of a time interval $i$ is given in (19). I borrow directly Deo's analysis for imperfectives as the analysis for the use of *-e?* in generics, shown in (20), where $P$ is a predicate of events, and $H_i$ is a set of histories $h$ of $i$. The idea is that generics talk about a generalization which holds at the reference time $i$, and which is likely to continue into the future inertia worlds of $w$ at $i$.

(19) $\mathscr{R}_i$ is a regular partition on an interval $i$ if $\mathscr{R}_i$ is a set of intervals $\{j,k,\ldots,n\}$ such that

a. $\bigcup\{j,k,\ldots,n\} = i$
b. $\forall j,k \in \mathscr{R}_i \rightarrow j \cap k = \emptyset$ if $j \neq k$
c. $\forall j,k \in \mathscr{R}_i \rightarrow \mu(j) = \mu(k)$ (i.e., the lengths of $j$ and $k$ are equal)

(20) $[\![\text{-}e?_{gen}]\!]^{c,w} = \lambda P \lambda i.\forall h[h \in H_i \rightarrow \exists j[i \subset_{nf} j \subset h \wedge \forall k \in \mathscr{R}_j \rightarrow \exists e[P(e,k,h)]]]$

The variable force effects accounted for by the double quantification (in *all* cells of the partition, there *exists* a $P$-event), together with contextual variability of the identity of the partition. For instance, in (11), the relevant partition would be one where each cell is a day-long interval, and the sentence comes out true so long as there is an event of Ramona making bread in each of those intervals. However, in a case like (16), the cells of the partition would consist of much longer intervals, perhaps one month long. Then, so long as there is at least one event of the speaker eating meat in each one month interval, (16) comes out true.

I adapt this analysis to the modal uses of *-e?* by defining a regular partition on the set of worlds delivered by a modal base. This is given in (21), where each cell of the partition consists of a set of worlds in the modal base B.

(21) $\mathscr{R}_{\mathrm{B}}$ is a regular partition on a set of worlds made accessible by a modal base B if $\mathscr{R}_{\mathrm{B}}$ is a set of sets of possible worlds $\{b_1,b_2,\ldots,b_n\}$ such that

a. $\bigcup\{b_1,b_2,\ldots,b_n\} = \mathrm{B}(w)$
b. $\forall b_j,b_k \in \mathscr{R}_{\mathrm{B}} \rightarrow b_j \cap b_k = \emptyset$ if $b_j \neq b_k$
c. $\forall b_j,b_k \in \mathscr{R}_{\mathrm{B}} \rightarrow |b_j| = |b_k|$

The modal use of *-eʔ* then makes use of the same sort of double quantification as in the generic cases. In the modal case, for every cell in the partition on the accessible worlds, there exists a world where the prejacent proposition $p$ is true. Since *-eʔ* is compatible with several modal flavors, we need not specify a particular type of modal base.[7] This analysis is stated in (22), where a suitable modal base and partition are taken to be presupposed by the context.

(22) $[\![\text{-}e\text{ʔ}_{mod}]\!]^{c,w}$ is only defined if $c$ provides a modal base B and regular partition $\mathscr{R}^c_{\mathrm{B}}$ on $\mathrm{B}(w)$. If defined,
$[\![\text{-}e\text{ʔ}_{mod}]\!]^{c,w} = \lambda p.\forall b_j[b_j \in \mathscr{R}^c_{\mathrm{B}} \rightarrow \exists w'[w' \in b_j \wedge p(w')]]$

The variable force effects are once again derived from the interaction between the double quantification and the size of the sets given by the partition. There are two extreme cases: (i) $\mathscr{R}^c_{\mathrm{B}}$ consists of one cell, which reduces to existential quantification over the worlds in $\mathrm{B}(w)$; (ii) $\mathscr{R}^c_{\mathrm{B}}$ consists of cells containing exactly one world, which results in universal quantification over the worlds in $\mathrm{B}(w)$. In all other cases, the quantificational force will be somewhere in between.

Within this account, we can also give the subjunctive morpheme *-hel* a straightforward analysis. Namely, it presupposes a non-maximal partitioning of the worlds in $\mathrm{B}(w)$. This has the effect that the extreme case in (ii) is unavailable for modalized clauses containing *-hel*, i.e., that strong universal quantification is ruled out.

## 6. Discussion

An advantage of the proposed analysis is that it allows us to account for the similarity in meaning between generic and pure modal uses of *-eʔ* with respect to variable force effects. In both cases, *-eʔ* is compatible with both strong and weak interpretations. While I have not provided a fully unified account of the two uses, I have assigned *-eʔ* two very closely related meanings, which involve universal quantification over the cells of a partition (over times or worlds), then existential quantification over the elements of each cell. This polysemous analysis provides a window into why the same linguistic item is used in both modal statements and generics in Washo.

One aspect of the analysis that remains unsatisfactory, however, is that it remains unclear exactly how context determines a partition to derive the variable force effects of the modal. In the generic cases, this is less of a problem, since it seems clearer how context can deliver a partition of regular time intervals, which can even be named by temporal adverbs such as *míʔleʔ guweʔéː:beyi* ‘every day’ in (11). But as it stands now, it is not clear how the context can deliver the right sort of partition over worlds to derive the strong and weak readings of the modal in a predictable way.[8]

Note that the analysis of Rullmann et al. (2008) for variable force effects in St’át’imcets faces the same challenge. In Rullmann et al.’s analysis, they derive variable force effects

[7] Of course we could in principle adapt (22) for specific types of modal bases, as would be needed for St’át’imcets modals, for instance.

[8] Thanks to a NELS reviewer for extensive discussion about this difficult issue.

via modal choice functions, which select a subset of the modal base, which is then universally quantified over. They also derive two extreme cases: (i) the modal choice function selects the entire set of worlds in the modal base, so universal quantification applies to the entire set, and we get the strong necessity reading; (ii) the modal choice function selects a singleton set from the modal base, so universal quantification over that set reduces to existential quantification. However, the identity of the choice function is left to context, and it is unclear exactly how the context provides a particular choice function to deliver a strong or weak reading of the modal. Their analysis is thus similar to mine in certain key respects, and is lacking in predictive power.

One account that does a better job at trying to explain how context constrains the possible interpretations of modals with variable force effects is that of Peterson (2010) for Gitksan. Under his account, variable force effects are derived from the number of propositions in the ordering source of a possibility modal. The ordering source serves to restrict the domain of quantification over the set of worlds delivered by the modal base. An empty ordering source places no further restriction on the set of worlds in the modal base. However, adding propositions to the ordering source has the effect of narrowing down the domain of quantification of the modal. Thus, as the ordering source narrows down the domain, existential quantification in effect becomes stronger, and in the extreme case collapses with universal quantification over a singleton set. This idea might be implemented in my account in the following way: while adding propositions to the ordering source in Peterson's account results in restriction in the worlds quantified over, under my account this would correspond to dividing up the partition into a greater number of cells. Recall that under my account, the increased number of cells in the partition leads to stronger quantificational force. I must leave a fully fleshed out implementation of this idea for future work.

In sum, the major challenge of my analysis (and indeed Rullmann et al.'s as well) is to get the right kind of domain restriction for quantification, and to account for what role the context plays in determining the different possibilities.

## 7. Conclusion

The major empirical point made in this paper is a confirmation of the existence of modal systems where variable force effects are derived from an underlying necessity modal, whose interpretation is weakened in context. Evidence for this state of affairs comes from the variable force effects that are present even in DE environments. Further indirect evidence comes from conditionals and generics, where the Washo modal *-e?* is obligatory in environments where covert necessity operators have been proposed for languages like English. That is, Washo wears the universal quantification on its sleeve. This state of affairs offers interesting analytic consequences for conditionals and generics, which should be explored in future work.

The analysis I propose is intended to capture the variable force effects in all these environments by making use of double quantification over cells of contextually-determined partitions over the domain of times or worlds. However, the major challenge remains of how exactly the context determines the partition to derive the variable force effects, an issue which is not unique to my analysis, and which therefore requires further investigation.

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