Verb stem plurality and pluractionality in Navajo

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1 Introduction

- Navajo or Dine Bizaad (iso: nav) is a member of the Southern or Apachean branch of the Dene language family spoken on the Navajo Nation in Southwestern US.
- Most fluent speakers are over 40, with very few monolingual speakers, and almost no Navajo is being learned in homes as a first language (Chee 2017).
- Colleges and the University at Crownpoint on the Navajo Nation and at the University of New Mexico in Albuquerque have programs on Navajo language and culture to maintain and support community-based documentation.
- Navajo has a highly complex verbal morphology. The lexicon is primarily verbal; verbs are complete propositions. The verb is divided into three distinct domains: disjunct, conjunct, and stem (Young & Morgan 1987; McDonough 1990):

(1) [Disjunct Conjunct Stem]$_{\text{Wdverb}}$
Ch'é -hé -**lyeed**
OUT -SER.3 -walk.**SG**.IPFV
'They walk out one at a time.'

- The rightmost element is the monosyllabic verb stem. Plurality is marked in all three domains.
- We focus on how the verb stem plurality interacts with the seriative marker (SER) within the ASPECT domain of the conjunct.
- Much of the Navajo data comes from Young & Morgan 1987 (Y&M.d = dictionary; Y&M.g = grammar); Uncited examples are from our Navajo speaker coauthor, Melvatha Chee.
- Verbs are split into Disjunct.Conjunct-Stem with only relevant glossing. The glosses are simplifications of the structure for presentation purposes.

2 Plural verb stems

- The verb stems, which Young & Morgan (1987) call these 'classificatory verbs', encode features either for intransitive subjects or transitive objects.
- These features include physical properties and/or number in addition to manner of action/state. Here, we focus on the contrasts based on number.
- Table 1 shows some forms encoding intransitive subject SG/DU/PL contrasts.

	SG	DU	PL
go, walk	Øyá/d-zá	Ø'áázh	(d)kai, l-dee'
lie down, lie	ni-Øtį́	Øtéézh	ni-jéé'
sit down, sit	Ødá	ni-Øké	di-ni-Øbin
run	lwod	'ahi-ni-lchą́ą́'	Øjee'

Table 1: Perfective (PFV), active forms from Young & Morgan 1987: pp. 133-134

- These can be analyzed as encoding the number of participants that take part in an event, e.g., number of agents of the walking verb stems in (2).

(2) a. *-dzá* : $\lambda e.\mathsf{walk}(e) \wedge |ag(e)| = 1$ (one walking)
b. *-'áázh* : $\lambda e.{}^{*}\mathsf{walk}(e) \wedge |{}^{*}ag(e)| = 2$ (two walking)
c. *-kai* : $\lambda e.{}^{*}\mathsf{walk}(e) \wedge |{}^{*}ag(e)| > 2$ (three+ walking)

3 Seriative

- The seriative marker, the form *hi* or allomorphs, adds a meaning of sequential events 'one after another', as in (3).

(3) jaa'abaní tsé'ą́ą́-dę́ę́' ch'ídahaas-t'a'
bat cave-from out.PL.SER.3-FLY.PFV
'The (3+) bats flew one after another out of the cave.' (YM.g p. 83)

- Bogal-Allbritten (2010) proposed the analysis in (4) for the Navajo seriative based on Lasersohn's (1995)'s analysis of the pluractional.

(4) $[\![hi\text{-V}]\!] = \forall e, e' \in E[P(e) \wedge \neg\tau(e) \circ \tau(e')] \wedge |(E)| > 2$
(Bogal-Allbritten 2010: (13))
A verb V with *hi-* describes a set E, which has at least two sub-events e and e' with event property P whose runtime, τ, does not overlap ($\circ$).

4 Verb Stem + Seriative

- With the seriative, the verb stem indicates how many individuals are involved in each sub-event, shown in the verb stem/verb stem+seriative contrast below:

(5) Ch'é-**lyeed**
out.3-walk.IPFV.**SG**
'S/he walks out.'

(6) Ch'é-**'aash**
out.3-walk.IPFV.**DU**
'Two walk out.'

(7) Ch'é-**jéél**
out.3-walk.IPFV.**PL**
'They (3+) walk out.'

(8) Ch'éhé-**lyeed**
out.SER.3-walk.IPFV.**SG**
'They walk out one at a time.'

(9) Ch'éhé-**'aash**
out.SER.3-walk.IPFV.**DU**
'They walk out in pairs.'

(10) Ch'éhé-**jéél**
out.SER.3-walk.IPFV.**PL**
'They walk out in groups of 3+.'

- In some cases, the individuals are the same across subevents, e.g.,
  - one slender, stiff object: verb stem *tɬįh* in (11), and
  - two individual subjects (dual): verb stem *t'aash* in (12).

(11) Chizh t'ááłá'í dihidish-**tɬįh**-go
firewood just.one fire.SER.1SG-handle.SLEN.STIFF.**SG.OBJ**-CONN
t'áá shǫǫ t'áadoo 'ásdįįdí yísḵą
luckily without.becoming.exhausted it.dawns
'I put a piece of firewood into the fire (moving it time after time as it burned) and luckily it lasted all night.' (Y&M.d: p. 317)

(12) Sitsilí dóó shideezhí t'áá 'ákwííjį 'ólta'-d'ęę bus yee
my.younger.brother and my.sister every.day school-from bus with.it
ninláhá-**t'aash**
TERM.BACK.SER-go.**DU**
'My little brother and sister come home from school every day by bus.'
(Y&M.d: p. 645)

- Plural verb stems like *jaa'* in (13), can mean 'one by one' or 'group by group'.

(13) naaltsoos ch'éhé-**jaa'**
books out.SER.1SG-handle.PFV.**PL.OBJ**
'I carried the books out one book/stack after another.'

- Translations using 'one by one' with the plural verb stem often appear with *t'áá 'ałkéé'* 'in a series'.

(14) 'Ólta-'dęę' t'áá 'ałkéé' ch'íhii-**jeeh**-go k'adęę
school-From in.series out.SER.1DU-run.IPFV.**PL**-CONN nearly
'ałné'é'aah-go 'ałtso ch'íhee-**jéé'**
be.noon.IPFV-CONN all out.SER.1DU-run.PFV.**PL**
'We (pl) ran one after the other out of the school and it was nearly noon when we all got out.' (YM.d p. 284)

- The seriative with plural form is also acceptable in a *one by one* context, including with adverbials. *t'áá ałkéé'* 'in a series' or *t'áá sáhí* 'alone'.

(15) [Context: My siblings and I went to our mom's house for dinner. Everyone arrived separately, one by one.]
  a. Shi-má bi-ghandi nihisii-**kai**
  1SG-mom 3-home TERM.SER.1DU-go.**PL**
  'We (3+) arrived one after another.'
  b. Shi-má bi-ghandi t'áá ałkéé' nihisii-**kai**
  1SG-mom 3-home in.a.series TERM.SER.1DU-go.**PL**
  'We (3+) arrived sequentially one after another.'
  c. Shi-má bi-ghandi t'áá sáhí nihisii-**kai**
  1SG-mom 3-home alone TERM.SER.1DU-go.**PL**
  'We (3+) arrived alone one after another.'
  d. Shi-má bi-ghandi t'áá sáhí nihii-**dzá**
  1SG-mom 3-home alone TERM-SER.1DU-go.**SG**
  'We arrived alone one after another.'

- Based on example translations and native speaker judgments the seriative has the following meaning with the SG/DU/PL verb stems:
  - SG: one by one; can be same one as in ((11))
  - DU: two by two; can be same two as in (12)
  - PL: one by one or group by group

- **Proposal:** The seriative with a plural verb stem is ambiguous between a one by one and a group by group reading.

5 Semantic account

- The seriative is similar to the Kaqchikel pluractional *-la'* (see (16)) or English *X by X* (e.g., *They walked in two by two*) (see Brasoveanu & Henderson 2009).
- Kaqchikel pluractional: the numeral form in Kaqchikel determines *one by one* or *group by group* reading.
  - Plain numeral *oxi'* 'three' in (16): *one by one* reading with three total
  - Reduplicated numeral *ox-ox* in (17): *three by three* reading

(16) X-e'-in-q'ete-*la'* oxi' ak'wal-a'.
CP-A3p-E1s-hug-*la'* three child-PL
'I hugged three children individually.' (Kaqchikel, Henderson 2014: (96))

(17) X-e'-in-tij-*la'* ox-ox wäy.
CP-A3p-E1s-eat-*la'* three-RED tortilla
'I kept eating the tortillas in groups of three.'
(Kaqchikel, Henderson 2014: (105))

- The Navajo seriative is distinct in that the plural verb stem can either have a *one by one* or *group by group* meaning.
- Below are the possible meanings of the seriative with a singular *dzá* (18), dual *'áázh* (19), or plural *kai* (20) stem:

(18) $[\![nihiidzá_{\text{SG}}]\!] =$
a. $\exists E.\forall e,e' \in E[\neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2 \wedge \underline{\mathsf{walk}(E) \wedge |ag(E)| = 1}$
b. $\exists E.\forall e,e' \in E[\underline{\mathsf{walk}(e) \wedge |ag(e)| = 1} \wedge \neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2$

(19) $[\![niheet'áázh_{\text{DU}}]\!] =$
a. $\exists E.\forall e,e' \in E[\neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2 \wedge \underline{^*\mathsf{walk}(E) \wedge |^*ag(E)| = 2}$
b. $\exists E.\forall e,e' \in E[\underline{^*\mathsf{walk}(e) \wedge |^*ag(e)| = 2} \wedge \neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2$

(20) $[\![nihisiikai_{\text{PL}}]\!] =$
a. $\exists E.\forall e,e' \in E[\neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2 \wedge \underline{^*\mathsf{walk}(E) \wedge |^*\theta(E)| > 2}$
b. $\exists E.\forall e,e' \in E[\underline{^*\mathsf{walk}(e) \wedge |^*\theta(e)| > 2} \wedge \neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2$

- (a) reading: the verb stem describes the total participants in the event
- (b) reading: the verb stem describes the number of sub-event participants

6 Discussion

- We propose the seriative and verb stem plurality interact to create ambiguity, but there is more to investigate to determine when one reading is more salient.
- In one set of contexts where only one of the (a) or (b) reading is TRUE, the sentence was acceptable only when the (b) reading was true.
- In context (15), where the (a) reading is TRUE and the (b) reading is FALSE, the seriative with the plural *kai* was acceptable.
- While investigation into whether one of these readings is derived through a cancelable implicature was initially promising,
  - the implicature doesn't seem to disappear under negation, and
  - our Navajo speaker coauthor found cancellation tasks to be quite unnatural sounding, necessitating other strategies for investigation.

7 Conclusion

- Using semantic diagnostics we investigated the interaction between two types of verbal plural marking: the seriative and the verb stem.
- An ambiguity approach best accounts for the data presented here.
- The seriative may co-occur with other Navajo plural markings, such as the iterative and repetitive modes, resulting in complex interactions.
- For example, this account has not discussed the plural/distributive morpheme, *da*, which gets the *group by group* reading.

(21) Shi-má bi-ghandi ni**da**hisii-kai
1SG-mom 3-home TERM.DA.SER-go.PL
'We (3+) arrived one group after another.'

- This study is a step towards investigating these understudied constructions.

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A Comparison with Kaqchikel

- Comparing the three languages' pluractional based on Bogal-Allbritten's (2010) account of the pluractional:

(22) $[\![$*nihisiikai* (*hi-V*-PL)$]\!] =$

a. $\exists E.\forall e,e' \in E[\neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2 \wedge \underline{^*\mathsf{walk}(E) \wedge |^*\theta(E)| > 2}$

b. $\exists E.\forall e,e' \in E[\underline{^*\mathsf{walk}(e) \wedge |^*\theta(e)| > 2} \wedge \neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2$

(23) $[\![$V-*la'* THREE$_{\text{Kaqchikel}}]\!] =$

a. $\exists E.\forall e,e' \in E[\neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2 \wedge \underline{^*\mathsf{verb}(E) \wedge |^*\theta(E)| = 3}$

(24) $[\![$*three by three*$_{\text{English}}]\!] =$
$[\![$V-*la'* THREE-RED$_{\text{Kaqchikel}}]\!] =$

b. $\exists E.\forall e,e' \in E[\underline{^*\mathsf{verb}(e) \wedge |^*\theta(e)| = 3} \wedge \neg\tau(e)\circ\tau(e')] \wedge |(E)| > 2$

- Henderson (2014) analyzes the Kaqchikel pluractional in Dynamic Plural Logic (DPlL) as distributing an event into atomic subevents that have an atomic thematic role associated with them:

(25) Pluractional Distributivity, *-la'*
$\mathsf{max}^{e',x'}(e' > n \wedge \mathsf{r}-\mathsf{part}(e',e) \wedge \mathsf{r}-\mathsf{part}(x',x)) \wedge \mathrm{TH}(e',x')$

- Henderson's (2014) account requires atomic subevents and atomic participants, so the dependent indefinite, *oxox* THREE-RED, is interpreted as a *group* of three.

- This account could be extended to the Navajo case presented here with two changes:
  - The verb stem would not require the individual variable to store an evaluation plurality, unlike the dependent indefinite.
  - With the pluractional, the verb stem could be interpreted as a group or a plurality to allow for the two possible readings (*one by one* or *group by group*).

- An alternative way to formalize the sequential nature of the subevents is to follow Brasoveanu & Henderson's (2009) account of English *one by one* construction by specifying the linear order of atomic events.