Zero and the Grammar of Absence

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Modification and (Non-)Existence Entailing Predicates
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Introduction

One (possible) modifier that can convey nonexistence is *zero* and its counterparts across languages:

(1) Zero capybaras sneezed.

How is this related to other expressions of nonexistence?

(2)
a. No capybara sneezed.
b. There aren't any capybaras that sneezed.
c. There is no such thing as a sneezing capybara.

Empirical phenomena:

- words for ‘zero’ in English, Cantonese, and Ktunaxa
- the contexts in which it occurs, and what sort of ‘zero’ is involved: what precisely is there zero of?
- arising from this, brief speculation about *no such thing* and its possible Ktunaxa counterpart

Roadmap

- ✓ Introduction
- **Zero in English and in general**
- The hunt for null individuals in Cantonese
- Zero and absence in Ktunaxa
- Reflections on ‘no such thing’
- Conclusion

Zero-membered pluralities

(3) a. Three dogs barked.
$\exists x[\mathbf{dogs}(x) \wedge \mathbf{barked}(x) \wedge |x| = \mathbf{3}]$

b. Zero dogs barked.
$\exists x[\mathbf{dogs}(x) \wedge \mathbf{barked}(x) \wedge |x| = \mathbf{0}]$

Bylinina & Nouwen (2016, 2018): If numerals express the cardinality of a plurality and *zero* is a numeral, we are led to a perhaps disconcerting conclusion:

- **The Null Individual Hypothesis**
  The ontology of natural language includes plural individuals with no members.

For English, this is plausible (despite some counterevidence; Chen 2018, Haida & Trinh 2020) but provocative:

- Are such null individuals ontologically suspect? (in B&N's words, 'an ontological oddity')?
- Are they perilously close to the 'quantificatious' (Geach 1972) temptation to suppose that *no one* denotes a null individual?

Are null individuals conceptually expected?

Null individuals aren't conceptually crazy, B&N point out. Indeed, they might even be *expected* a priori.

Link (1983)'s definition of his * pluralization operator resembles (4) (but is not identical to it):

(4) $^{*}Z \stackrel{\text{def}}{=} \{\sqcup X : X \subseteq Z\}$ *(fake! not actual!)*

This would mean the join of any subset of **dog** would be among the dogs in ***dog**.

But if the join of any subset of **dog** is in ***dog**, that would include the null set, making the null individual a member of ***dog**:

(5) a. $\textbf{dog} = \{\textbf{Howard}, \textbf{Bagel}, \textbf{Hildy}\}$

b. $^*\textbf{dog} = \left\{ \begin{array}{l} \sqcup\{\textbf{Howard}, \textbf{Bagel}, \textbf{Hildy}\}, \\ \sqcup\{\textbf{Howard}, \textbf{Bagel}\}, \sqcup\{\textbf{Howard}, \textbf{Hildy}\}, \ldots \\ \sqcup\{\textbf{Howard}\}, \sqcup\{\textbf{Bagel}\}, \sqcup\{\textbf{Hildy}\}, \\ \sqcup\varnothing, \end{array} \right\}$

Link excludes the empty set by adding to * a stipulation:

(6) $^*Z \stackrel{\text{def}}{=} \{\sqcup X : X \subseteq Z \wedge X \neq \varnothing\}$

If * represents pluralization, why should every language have a plural morpheme that recapitulates Link's stipulation?

- Perhaps functional reasons?
- But shouldn't we expect at least a few exceptions?

Isn't 'zero' just a way of saying 'no'?

B&N provide several arguments against a quantificational view of *zero*.

Ellipsis *Zero* licenses NP ellipsis, but *no* doesn't:

(7) John owns four cars. Bill owns $\left\{\begin{array}{l} \text{three cars} \\ \text{three} \\ \text{zero cars} \\ \text{zero} \\ \text{no cars} \\ {}^{*}\text{no} \end{array}\right\}$.

On its own, this may just be evidence that *zero* is syntactically more like *none* than *no*.

Measure terms *No* is impossible with measure terms:

(8) There are $\left\{\begin{array}{l} \text{zero} \\ \text{thirteen} \\ {}^{??}\text{no} \end{array}\right\}$ liters of milk in the fridge.

This may be OK with enough contextual support.

Per Expressions like *A per B* aren't good with *no*:

(9) $$\text{This drink contains} \left\{ \begin{array}{l} \text{ zero} \\ \text{ thirteen} \\ {}^{*}\text{no} \end{array} \right\} \text{grams of sugar per bottle.}$$

This isn't terrible for me, but (10) is a clearer judgment:

(10) **A:** How many grams of sugar does this drink have per bottle?

$$\textbf{B:}\ \text{It has} \left\{ \begin{array}{l} \text{ zero} \\ \text{ thirteen} \\ {}^{*}\text{no} \\ {}^{*}\text{none} \end{array} \right\} \text{per bottle.}$$

Repetition adverbials

(11) John visited his grandmother $\left\{\begin{array}{l} \text{zero} \\ \text{thirteen} \\ ^{??}\text{no} \end{array}\right\}$ times.

Factor phrases (This one isn't from B&N.)

(12) Floyd ate $\left\{\begin{array}{l} \text{two} \\ \text{zero} \\ ^{??}\text{no} \end{array}\right\}$ times more calories than his brother.

Tag questions Tag questions in English obligatorily reverse the polarity of the matrix sentence:

(13) a. John loves her, $\left\{\begin{array}{l}\text{*does}\\ \text{doesn't}\end{array}\right\}$ he?

b. John doesn’t love her, $\left\{\begin{array}{l}\text{does}\\ \text{*doesn't}\end{array}\right\}$ he?

c. No students have read my book, $\left\{\begin{array}{l}\text{have}\\ \text{*haven't}\end{array}\right\}$ they?

That can test for whether *zero* is negative in the relevant sense, and it isn’t:

(14) Zero students have read my book, $\left\{\begin{array}{l}\text{*have}\\ \text{haven't}\end{array}\right\}$ they?

NPI licensing *Zero* doesn’t license NPIs, including *in years*:

(15) { No students / #Zero students } have visited me in years.

There’s some inconsistency around other NPIs, and B&N mention variation in judgments reported in the literature:

(16) a. ??Zero students said anything.
b. *Zero students bought any car.

Chen (2018): *zero* can sometimes license NPIs:

(17) a. Julia has {no / zero} publications in anything related to linguistics.

b. Adding "write a book" to your to-do list will result in {no / zero} books ever being written.

With mass nouns Chen (2018): there are some contexts where *zero* patterns with *no* rather than numerals.

(18) a. Mary has $\left\{\begin{array}{c}\text{zero}\\ \text{no}\\ \text{*one}\end{array}\right\}$ tolerance for betrayal.

b. Jack showed $\left\{\begin{array}{c}\text{zero}\\ \text{no}\\ \text{*one}\end{array}\right\}$ interest in physics.

More about these sorts of examples is to come.

B&N's proposal

In a nutshell, B&N propose to replace the classic Link pluralization operator with a zero-tolerant one:

(19) a. **Classic**
$^{*}Z \stackrel{\text{def}}{=} \{\sqcup X : X \subseteq Z \wedge X \neq \varnothing\}$

b. **Proposed**
$^{\times}Z \stackrel{\text{def}}{=} \{\sqcup X : X \subseteq Z\}$

All plural nouns would have the null individual in their extension.

An immediate problem Predicts denotations like (20):

(20) $[\![$ *Zero capybaras sneezed* $]\!]$
$= \exists x[|x| = 0 \wedge {}^{\times}\mathbf{capybara}(x) \wedge {}^{\times}\mathbf{sneezed}(x)]$

This denotation is too weak.

- Predicts that sentence should be true if no fewer than zero capybaras sneezed.
- That is always true, even if in fact three of them did.

The fix B&N introduce an exhaustification operator (Chierchia 2004) that negates truth-conditionally stronger alternatives:

(21) $[\![$ *EXH Zero capybaras sneezed* $]\!]$

$$= \exists x[\, |x| = 0 \wedge {}^{\times}\textbf{capybaras}(x) \wedge {}^{\times}\textbf{sneezed}(x)\,] \wedge$$
$$\neg\exists y[\, |y| > 0 \wedge {}^{\times}\textbf{capybaras}(y) \wedge {}^{\times}\textbf{sneezed}(y)\,]$$

Yields the 'exactly zero' reading. (See Haida & Trinh 2020 for an interesting reappraisal of this part of the analysis.)

Maybe it's all degree quantification?

Bylinina & Nouwen (2018) & Chen (2018): if numerals are actually degree quantifiers, type $\langle dt, t\rangle$, à la Kennedy (2015), maybe zero could be too, without requiring a null individual.

(22) Three capybaras sneezed.

a. three λd [[d-MANY capybaras] sneezed]

b. $\mathbf{max}\{d : d\text{-many capybaras sneezed}\} = \mathbf{3}$

Stipulating that $\mathbf{max}(\varnothing) = \mathbf{0}$ would make it possible to avoid a null individual:

(23) Zero capybaras sneezed.

a. zero λd [[d-MANY capybaras] sneezed]

b. $\mathbf{max}\{d : d\text{-many capybaras sneezed}\} = \mathbf{0}$

But!

- In English, maybe degree quantification makes *zero* possible without null individuals.
- But many languages lack degree quantification (Beck et al. 2009, Bochnak 2013, 2015).
- If we're going to find evidence for null individuals, we should look at those.

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The Cantonese data

- Chinese is a language without degree quantification (Krasikova 2008, Beck et al. 2009).
- It uses zero frequently and in lots of contexts.
- Is there evidence of null individuals there?
- The Mandarin facts seem to be largely the same.
- (This largely recapitulates Chow & Morzycki 2022.)

NPI licensing *Ling4* ‘zero’ fails to license NPIs in Cantonese:

(24) #ling4 gei1 wui2 gaa1 jam6 ho4 sik1
zero chance add any interest rate
‘zero chance lift any interest rate’

Thus *ling4* ‘zero’, like English *zero*, is unlikely to be a negative quantifier.

Numerals Licensing numerals in Cantonese generally requires a classifier:

(25) a. leong5 go3 pang4 jau5
two CL.unit friend
'two friends'

b. jat1 zek3 gau2
one CL.livestock dog
'one dog'

Zero is incompatible with classifiers *Ling4* 'zero' with a classifier is odd:

(26) a.

#ling4	go3	pang4 jau5
zero	CL.unit	friend

'zero friends'

b.

#ling4	zek3	gau2
zero	CL.livestock	dog

'zero dogs'

Unit nouns For the class of (what we'll call) **UNIT NOUNS**, numerals can occur but obligatorily without a classifier:

(27) a. sap6 ng5 fan1
ten five grade
'fifteen grade points'

b. ji6 sap6
two ten
kaa1 lou6 leoi5
calories
'twenty calories'

c. saam1 seoi3
three age
'three years old'

(28) #sap6 ng5 go3 fan1
ten five CL.unit grade
'fifteen grade points'

Zero and unit nouns Even though *ling4* 'zero' is incompatible with classifiers, it *is* compatible with unit nouns:

(29) a. ling4 fan1
zero grade
'zero grade points'

b. ling4 kaa1 lou6 leoi5
zero calories
'zero calories'

c. ling4 seoi3
zero age
'zero years old'

Chance nouns with nonzero numerals A third class of nouns—**CHANCE NOUNS**—are also incompatible with (nonzero) numerals on their own, and require a classifier:

(30) a. leong5 ci3 gei1 wui2
two CL.instance chance
'two chances'

b. #leong5 gei1 wui2
two chance
'two chances'

But chance nouns allow ‘zero’ without a classifier:

(31) ling4 gei1 wui2
zero chance
‘zero chance’

Indeed, they *prohibit* classifiers with ‘zero’:

(32) #ling4 ci3 gei1 wui2
zero CL.instance chance
‘zero chance’

Chance nouns and their English counterparts Use of *ling4* 'zero' with chance nouns yields an emphatic reading.

This appears to be the Cantonese counterpart of a phenomenon observed in English by Chen (2018)—that some nouns allow zero but ban one and higher numerals:

(33) Mary has $\left\{\begin{array}{c}\text{zero}\\ \text{*one}\end{array}\right\}$ $\left\{\begin{array}{l}\text{tolerance for betrayal}\\ \text{interest in physics}\\ \text{sense of fashion}\end{array}\right\}$.

These also get an emphatic reading.

The Cantonese facts in a nutshell:

- with concrete nouns:
  - numerals occur only with a classifier
  - zero is impossible
- with unit nouns:
  - numerals never occur with a classifier
  - zero is possible
- with chance nouns:
  - numerals occur with a classifier
  - zero is possible only without a classifier

Unit noun meanings

Unit nouns are like measure terms Unit nouns like ‘grade’ and ‘calories’ measure along a scale specified by the noun:

(34) a. ‘zero calories’: $\mu_{\textbf{calories}}(x) = \mathbf{0}$
b. ‘zero grade’: $\mu_{\textbf{grade}}(x) = \mathbf{0}$
c. ‘zero age’: $\mu_{\textbf{years}}(x) = \mathbf{0}$

We’ll build on this intuition by assimilating them to measure terms such as *liters* or *inches*.

Scontras (2014) on measure terms (in the spirit of Krifka 1989):

- combine with a kind-denoting complement
- take a numeral as an argument
- invoke a measure function

(35) a. $[\![\textit{pounds}]\!] = \lambda k \lambda n \lambda x[{}^{\cup}k(x) \wedge \mu_{\textbf{pounds}}(x) = n]$

b. $[\![\textit{30 pounds of cheese}]\!]$
$= \lambda x[{}^{\cup}\textbf{CHEESE}(x) \wedge \mu_{\textbf{pounds}}(x) = \textbf{30}]$

This extends to Cantonese unit nouns, except that they don't take complements:

(36) a. $[\![$ *kaa1 lou6 leoi5 'calories'* $]\!] = \lambda n \lambda x[\mu_{\textbf{calories}}(x) = n]$

b. $[\![$ *fan1 'grade'* $]\!] = \lambda n \lambda x[\mu_{\textbf{grade}}(x) = n]$

Predicts correctly that they should freely occur with arbitrary numerals, including zero:

(37) a. $[\![$ *ling4 'zero' kaa1 lou6 leoi5 'calories'* $]\!]$

= $\lambda x[\mu_{\textbf{calories}}(x) = \mathbf{0}]$

b. $[\![$ *loeng5 'two' kaa1 lou6 leoi5 'calories'* $]\!]$

= $\lambda x[\mu_{\textbf{calories}}(x) = \mathbf{2}]$

Classifier meanings

Classifiers too can be viewed as similar to measure terms (Jenks 2011, Scontras 2014 a.o.), assuming Chinese bare nouns denote kinds (Chierchia 1998 a.o.):

(38) $[\![\textit{go3 ‘}\textsc{cl}\textit{.unit’}]\!] = \lambda k \lambda n \lambda x[\pi(k)(x) \wedge \mu_{\mathbf{card}}(x) = n]$

Two components:

- Partition function π that divides individuates a kind into portions of its realizations.
- Cardinality requirement, now treated as just a variety of measure function (in the spirit of e.g. Solt 2009, Wellwood 2014).

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Yields a natural semantics for classifiers with numerals:

(39) $[\![$ *loeng5 'two' go3 'CL.unit' pang4 jau5 'friend'* $]\!]$
$= \lambda x[\pi(\textbf{FRIEND})(x) \wedge \mu_{\textbf{card}}(x) = \textbf{2}]$

Of course, zero would work equally well compositionally:

(40) $[\![$ *ling4 'zero' go3 'CL.unit' pang4 jau5 'friend'* $]\!]$
$= \lambda x[\pi(\textbf{FRIEND})(x) \wedge \mu_{\textbf{card}}(x) = \textbf{0}]$

But unlike other numerals, zero is impossible in such examples!

Is this just a presupposition? Unlikely.

A more interesting conclusion:

- The ontology of Cantonese simply lacks null individuals.
- A constraint on models in Cantonese.
- There's more to be said about what it means to lack an object in the model.

Predicts that zero would occur freely, but *only* when not measuring cardinality.

Chance noun meanings

Reminder:

- Chance nouns prohibit a classifier with zero but require one with other numerals.

With chance nouns, what rules out zero in the presence of a classifier?

- Again, classifiers measure cardinality, and…
- …there are no zero-membered pluralities in Cantonese.

But what permits zero in the absence of a classifier?

Giving chance nouns degree arguments following Chen (2018):

(41) a. $[\![$ *gei1 wui2 'chance'* $]\!]$
$= \lambda n : n < 1 \,.\, \lambda x[\textbf{chance}(x) \wedge \mu_{\textbf{chance}}(x) = n]$

b. $[\![$ *ling4 gei1 wui2 'chance'* $]\!]$
$= \lambda x[\textbf{chance}(x) \wedge \mu_{\textbf{chance}}(x) = \textbf{0}]$

The presupposition in (41a) ensures that numbers one and higher are impossible.

Probably doesn't need to be captured as a separate presupposition. Follows from the probability measurement function, which has an upper bound of 1.

In both Chinese and English, chance nouns:

- are often also compatible with fractions and percentages
- chance nouns seem to be associated with closed scales
- yield a 'compound-like' syntactic structure (in Cantonese, they license the modificational particle *ge*, counterpart to Mandarin *de*)
- numerals in these constructions (seem to) measure non-monotonically (in the sense of Schwarzschild 2006)

Tropes or property concept qualities Instead of assigning these nouns a degree argument, one could treat them as denoting a property of a suitable abstract object:

- tropes (Moltmann 2009)
- property concept qualities/substances (Francez & Koontz-Garboden 2011, 2017)

Zero portions One intriguing possibility involving the property concept qualities approach:

- Implemented straightforwardly, 'zero trust' would involve measuring the amount of a portion of property concept and finding it to be zero.
- Then Cantonese would have no zero-membered pluralities, but it *would* have zero-amount portions.

But do we have evidence for null individuals in Chinese? No.

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The language

Another language with degrees (Bertrand in preparation) but probably no QR of degrees: Ktunaxa.

Situation is not entirely clear, because:

- Even though Ktunaxa seems to have degree arguments, it doesn’t use them conventionally.
- In particular, it has no measure phrases, so e.g. ‘zero liters’ is independently ruled out.
- Even the individual ’quantifiers’ don’t denote generalized quantifiers.

Ktunaxa:

- An isolate.
- Spoken in Interior British Columbia in Canada and Idaho and Montana in the US.
- 18 fluent speakers in Canada (FPCC, 2022).
- Active revitalization efforts.

That which is absent

Ktunaxa's basic 'zero':

(42) **Context:** *a card game*

ki-ɫu	qapsin
COMP-absent	WH.INDEF

'zero'

Roughly 'that which is absent'.

That which is absent

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(42) **Context:** *a card game*

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'zero'

Roughly 'that which is absent'.

The predicate *ɬu* means ‘to be absent’ or ‘to not be there’:

(43) **Context:** *You knock on Mary’s door, but no one answers.*

ɬuʔ-ni Maɬi.
absent-IND Mary
‘Mary isn’t home.’

(44) **Context:** *You’re checking what food you have in the fridge.*

ɬuʔ-ni çikin.
absent-IND chicken
‘We’re out of chicken.’

Truly lexicalized

This seems not to be a recent or superficial element of the language:

(45) **Researcher:** Do you ever remember your parents or any Ktunaxa speakers saying: *kiɫu qapsin*?

Consultant: Yes.

Researcher: When would they say it?

Consultant: My mother played cards, she would say *kiɫu qapsin*. When they were adding their points against each other. Like who won the set.

This truly is a ‘zero’ rather than just a nominalization of ‘absent’. It’s used robustly to refer to a number.

As a phone number:

(46)

Wist̓ała,	wist̓ała,	ki-ɬu	qapsin,	qaɬsa,	yiku,	ʔukiy,
seven	seven	COMP-absent	WH.INDEF	three	five	one

ki-ʔas,	ki-ɬlu	qapsin,	quykit̓wu,	wist̓ała
COMP-two	COMP-absent	WH.INDEF	nine	seven

‘770–351–2097’

Arithmetic:

(47)

Ki-ʔas	taxa-s	piskiniɫ	ki-ʔas	ʔin-i	ki-ɫu
COMP-two	then-OBV	drop	COMP-TWO	COP-IND	COMP-absent

qapsin
WH.INDEF

‘Two minus two is zero.’

Number games:

(48)

Hu	s-ił	knitwiłitiyaʔti	ʔup¢iʔtił	ni-s	ki-łu
1.SG	PROG-PRVB	think	number	DEM-OBV	COMP-absent

qapsin-s	¢	ʔit̓wus
WH.INDEF-OBV	CONJ	ten-OBV

‘I’m thinking of a number between zero and ten.’

Indeed, it's so lexicalized as 'zero' that it can't mean 'the absent thing' anymore:

(49) **Context:** *I make you a soup and ask you to taste test it. There's not enough carrots!*

#Hun	ʔupx-ni	ki-ɫu	qapsin-s!	Ni¢na!
1.SG	know-IND	COMP-absent	WH.INDEF-OBV	CARROT

Attempted: 'I know what is missing! Carrots!'

This appears to be a morphological blocking effect. The consultant repaired this sentence by adding a progressive marker:

(50) **Context:** *I make you a soup and ask you to taste test it. There's not enough carrots!*

Hun	ʔupx-ni	k-s-iɬ	ɬu	qapsin-s!	Niȼna!
1.SG	know-IND	COMP-PROG-PRVB	absent	WH.INDEF-OBV	CARROT

'I know what is missing! Carrots!'

Numeral or quantifier?

The issue In English and Cantonese, we asked whether the zero term is a quantifier or is a numeral. How about Ktunaxa?

Ktunaxa syntax In Ktunaxa, predicates are a syntactic category that typically occurs on the left, and can bear mood morphology:

(51) ŧ̓aɬukniʔ-ni pus.
meow-IND cat
'Cats meow.'

(52) Haq-ni xaɬ¢in.
swim-IND dog
'Dogs swim.'

Is 'zero' a quantifier? Quantifiers are just predicates:

(53) Q̓apiʔ-ni pus.
all-IND cat
'All the cats are there.'

(54) ɬuʔ-ni pus.
absent-IND cat
'There are no cats.'

'Zero' can't occur in this position, so it isn't a quantifier:

(55) #Ki-ɬu qapsin-ni pus
COMP-absent WH.INDEF-IND cat
Attempted: 'There are zero cats.'

Is ‘zero’ a numeral? Numerals are *also* predicates:

(56) ʔas-ni pus
two-IND cat
‘There are two cats.’

(57) Qaɬsa-ni xaɬç̓in
three-IND dog
‘There are three dogs.’

And ‘zero’ is not a predicate, unlike actual numerals.

Numerals can also occur as VP modifiers:

(58) Qaɬsa-ɬ haq-ni Maɬi
three-PRVB swim-IND Mary
'Mary swam three times.' *(preverb; ≈ adverb)*

(59) Qaɬsa-q̓ankimik La·t
three-walk La·t
'La·t took three steps.' *(prefix)*

'Zero' can't.

Numerals never include the *wh* indefinite *qapsin*, but ‘zero’ is ill-formed without it:

(60) ki-ʔas (*qapsin)
COMP-two WH.INDEF
‘two’

(61) ki-ɬu *(qapsin)
COMP-absent WH.INDEF
‘zero’

Upshot ‘Zero’ in Ktunaxa is *neither* a quantifier *nor* a(n ordinary) numeral!

So what is it, then? And what does this tell us about expressing absence? A clue: in referring to numbers and in counting contexts, numerals can be preceded optionally by a nominalizing complementizer, *k*-:

(62) **Context:** *You are playing hide and seek. You close your eyes and count to ten.*

ʔuki,	ki-ʔas,	qaƚsa,	xa·ƈa,	yi·ku,	ʔinmisa...
one	COMP-two	three	four	five	six...

'One, two, three, four, five six...'

The *k*- doesn't occur with numerals in predicate position.

The *k*- in *kiɫu qapsin* ‘zero’ is obligatory. But it suggests that it’s like the prefixed numerals in counting. **It’s a nominal.**

This suggests that:

- Relatively restricted distribution may be largely a syntactic fact.
- Means that its incompatibility with cardinality uses so far may be for syntactic reasons.
- It may also show that *k*- forces a number concept reading, which would be independently interesting.

Is the relatively restricted distribution of ‘zero’, and its absence from counting

Looking elsewhere

If e.g. (63) (repeated) is ungrammatical for syntactic reasons, is there another place we could hunt for null individuals?

(63) #Ki-ɬu qapsin-ni pus
COMP-absent WH.INDEF-IND cat
Attempted: 'There are zero cats.'

One possibility: counting predicates.

(64) **Context:** *You're taking inventory for a pet shop, and you need to count the number of cats in the shop.*

a. Qaɫsa ʔi-ni niʔi q'upc̦i·t-iɫ pus.
three COP-IND DEM count-PASS cat.
'Three is the [number of] cats that were counted.'

b. Ki-ɫu qapsin ʔi-ni niʔi q'upc̦i·t-iɫ pus.
COMP-absent WH.INDEF COP-IND DEM count-PASS cat.
'Zero is the [number of] the cats that were counted.'

Is counting predicate use evidence for null individuals? Depends on the semantics of the counting predicate (rough denotations only):

(65) **Null individual**

$$[\![\, q\text{'}up\text{¢}i\cdot t \text{ 'count'} \,]\!] = \lambda x \lambda d \lambda y \lambda w \,.\, \exists e \begin{bmatrix} \textbf{counting}_w(e, y, x) \wedge \\ |x| = d \end{bmatrix}$$

(66) **No null individual?**

$$[\![\, q\text{'}up\text{¢}i\cdot t \text{ 'count'} \,]\!]$$

$$= \lambda P_{\langle e,\, st\rangle} \lambda d \lambda y \lambda w \,.\, \exists e \begin{bmatrix} \textbf{counting}_w(e, y, P) \wedge \\ \textbf{count}_w(P) = d \end{bmatrix}$$

Suggests null individuals conceptually, at least. But still no clear hard evidence.

The absence predicate

The absence predicate out of which ‘zero’ is made is independently interesting.

First, it gets readings that correspond to different English absence expressions:

(67) ɫuʔ-ni kyaqɫa
absent-IND duck

a. ‘The ducks are absent.’
b. ‘Ducks are missing.’
c. ‘There are no ducks.’

On its own, *ɨuʔ-ni* favors a stage-level interpretation:

(68) **Context:** *Your friend tells you about her new boyfriend La·t, but she's known to lie, so you don't think La·t is a real person.*

#ɨuʔ-ni	La·t.
absent-IND	La·t

Attempted: 'La·t doesn't exist.'

This can be rescued with a habitual/generic marker *ʔat*:

(69) **Context:** *Your friend tells you about her new boyfriend La·t, but she's known to lie, so you don't think La·t is a real person.*

ʔat	ɨuʔ-ni	La·t.
GEN	absent-IND	La·t

'La·t doesn't exist.'

To not exist is, essentially, to be habitually absent.

There is another way to predicate nonexistence—a negative existential:

(70) **Context:** *Your friend tells you about her new boyfriend La·t, but she's known to lie, so you don't think La·t is a real person.*

Qa haqaʔ-ni La·t.
NEG exist-IND La·t
'La·t doesn't exist.'

These two forms contrast in ‘no such thing’ contexts:

(71) **Context:** *Your friend is scared of monsters, but you don’t believe in monsters. You tell her there’s no such thing.*

a. Qa haqaʔ-ni ʔi·ka
NEG exist-IND monster
‘There’s no such thing as monsters.’

b. #ɫuʔ-ni ʔi·ka
absent-IND monster
Attempted: ‘There’s no such thing as monsters’

Consultant comment: [This sentence] is more like ‘There are no monsters’. It’s like someone has said there was an *ʔi·ka* in your back forest. You go check it out. And then you tell them that there is no monster.

'No such thing' claims can also be expressed unambiguously with a particular form that uses 'called' as an ingredient:

(72) **Context:** *Your friend is scared of monsters, but they're being irrational. There's obviously no such thing as monsters.*

ʔat	qa	haqaʔ-ni	ni	qaɬ	ʔat-iɬ	ʔi·ka.
HAB	NEG	exist-IND	DEM	way-PRVB	name-PASS	monster

'There's no such thing as monsters'.
Lit: 'That which is called 'monster' does not exist.'

With explicit locations, a weaker reading than ‘no such thing’:

(73) **Denies presence of an elephant:**

ɬuʔ-ni kwuqsaɬa-s Vancouver-s.
absent-IND elephant-OBV Vancouver-OBV.
‘There is no elephant in Vancouver.’

(74) **Denies presence of species:**

a. ʔat ɬuʔ-ni kwuqsaɬa-s Vancouver-s
HAB absent-IND Vancouver-OBV
‘There are no elephants in Vancouver.’

b. Qa haqaʔ-ni kwuqsaɬa-s Vancouver-s
NEG exist-IND elephant-OBV Vancouver-OBV
‘There are no elephants in Vancouver.’

Roadmap

The issue

What does (75a) actually mean? How does it differ from (75b)?

(75) a. There’s no such thing as monsters.
b. There are no monsters.

The issue

What does (75a) actually mean? How does it differ from (75b)?

(75) a. There’s no such thing as monsters.
b. There are no monsters.
c. Monsters are $\left\{\begin{array}{l}\text{absent}\\\text{missing}\\\text{nonexistent}\end{array}\right\}$.

The issue

What does (75a) actually mean? How does it differ from (75b)?

(75) a. There’s no such thing as monsters.

b. There are no monsters.

c. Monsters are $\left\{\begin{array}{l}\text{absent}\\ \text{missing}\\ \text{nonexistent}\end{array}\right\}$.

Is there a kind of gradient of generality in predicating nonexistence?

- Doesn’t exist in principle.
- A kind is not instantiated in a region, at a time.
- Happens not to be present individually in a region, at a time.
- Is absent, but perhaps was expected or needed.

How compositional is this?

Should *no such thing* existentials be assembled compositionally? Seems to be fairly restricted syntactically:

(76)
a. There’s no such thing as monsters.
b. #There’s no thing such as monsters.
c. ??There are no things such as monsters.

(77)
a. No such thing as monsters exists.
b. #No thing such as monsters exists.
c. ??No things such as monsters exist.

(78)
a. ??No such thing as monsters threatens humanity.
At best, means: ‘Nothing like monsters threatens humanity.’
b. #I resent no such thing as monsters.
At best, means: ‘I resent nothing that resembles monsters.’

But these are OK, so maybe it's just *such a thing* that's fixed:

(79)
a. ?There isn't such a thing as monsters.
b. ?Such a thing as monsters doesn't exist.

May be an NPI on the relevant reading:

(80)
a. No one claimed to see such a thing as monsters.
b. #Every child claimed to see such a thing as monsters.
c. #Every child who saw such a thing as monsters regretted it.

The *as* phrase is optional:

(81) Floyd thought he saw a monster, but he had seen no such thing.

An intensional claim

First, a false start Too crude an approach:

(82) There’s no such thing as monsters.
‘The kind **MONSTER** doesn’t exist.’

- We know *such* involves kinds (Carlson 1977, Landman 2006), so maybe it denies the existence of the kind?
- But if a kind is essentially a plurality across worlds (Chierchia 1984, 1998), this would mean the kind has no realizations in any world.
- But that’s far too strong. There’s no such thing as monsters, but they’re not logically impossible!

A more plausible weaker version

- *No such thing* denies that a kind is realized in worlds (sufficiently) similar to the actual one.

(83) There's no such thing as monsters.
$\neg\exists w' \in \textbf{Similar}(w)\, \exists x[{}^{\cup}\textbf{MONSTER}(x)(w')]$

An extensional strategy

Is this intensional at all? Could we get away with something weaker still?

- *No such thing* just denies that a kind is realized in the actual world.

(84) There’s no such thing as monsters.
$\neg \exists x[{}^{\cup}\textbf{MONSTER}(x)(w_0)]$

But then how to distinguish the two sentences?:

(85) a. There are no monsters.
b. There’s no such thing as monsters.

A potential answer:

- *No such thing* just makes a claim that isn't contextually restricted.

(86) There's no such thing as monsters.
$\neg\exists x[{}^{\cup}\textbf{MONSTER}(x)(w_0)]$

Out-of-the-blue bare existentials are contextually restricted (illustrated here roughly à la Francez 2009):

(87) a. There are no monsters.
b. $[\![\,\textit{there}_C \textit{ are no monsters}\,]\!] = [\![\,\textit{no monsters}\,]\!](\lambda x\,.\,x \in C)$
$= \neg\exists x[\textbf{monsters}(x)(w_0) \wedge x \in C]$

But supposing *no such thing* simply makes a contextually unrestricted claim seems too weak, especially with modifiers. Only (88b) and (89b) suggest the absence is a matter of principle:

(88) a. There are no capybaras in Norway.
b. There is no such thing as capybaras in Norway.

(89) a. There are no coffee in the department kitchen.
b. There is no such thing as coffee in the department kitchen.

Both (89b) and (88b) suggest a paraphrase with *could*, which may be evidence for taking these to be making a possibility claim.

Better option may be to maintain *both* the intensional semantics and the contextual restriction for *no such thing*:

(90) $[\![\textit{no such thing}]\!]$
$$= \lambda k \lambda P_{\langle e, st\rangle} \,.\, \neg\exists w' \in \mathbf{Similar}(w)\, \exists x[{}^{\cup}k(x)(w') \wedge P(x)(w')]$$

(91) a. There is no such thing as monsters.

b. $[\![\textit{there}_C \textit{ is no such thing as monsters}]\!]$
$$= [\![\textit{no such thing}]\!]([\![\textit{monsters}]\!])(\lambda x \,.\, x \in C)$$
$$= \neg\exists w' \in \mathbf{Similar}(w)\, \exists x[{}^{\cup}\textsc{monster}(x)(w') \wedge x \in C]$$

Epistemic readings

In some cases, an epistemic reading seems to surface:

(92) a. In Las Vegas, there are no moral transgressions.
#*It’s pandemonium out there, unrestrained debauchery.*

b. In Las Vegas, there are no such things as moral transgressions.
It’s pandemonium out there, unrestrained debauchery.
‘In Las Vegas, it is believed that moral transgressions don’t exist in principle.’

(93) $$\neg\exists w' \in \textbf{Epis}_w(\textbf{Las-Vegas-residents}) \; \exists x[{}^{\cup}\textsc{moral-transgressions}(x)(w')]$$

Can (92a) marginally also get such a reading?

This doesn't seem restricted to the specific form *no such thing*:

(94) a. In Las Vegas, moral transgressions don't exist.
?? It's pandemonium out there, unrestrained debauchery.

b. In Las Vegas, no such things as moral transgressions exist.
It's pandemonium out there, unrestrained debauchery.

Epistemic readings may be mostly just a confound, a case of Maienborn (1995, 2001)'s frame adverbials:

(95) a. In France, Jerry Lewis is hilarious.
b. In the US, assault rifles are fun toys.

Upshot?

The upshot might be that in English and Ktunaxa both:

- predicates like *absent* indicate absence from a salient area/time
- negative existence claims like *does not exist* make more general claims
- ‘no such thing’ claims are intensional

Roadmap

- ✓ Introduction
- ✓ Zero in English and in general
- ✓ The hunt for null individuals in Cantonese
- ✓ Zero and absence in Ktunaxa
- ✓ Reflections on ‘no such thing’
- **Conclusion**

Conclusion

Zero in English and Cantonese:

- Zero proved a useful prove into nominal semantics. In both languages,chance nouns. In Cantonese, unit nouns and classifiers.
- Both languages use zero extensively.
  - In two different classes of constructions.
  - Across a wide variety of scale types.
- Some possible evidence of null individuals in English.
- But Cantonese prohibits zero in *exactly* the places where having it would required null individuals. It's going out of its way to tell us it lacks it, possibly as a matter of natural language metaphysics.
- Less clear that Cantonese lacks zero portions.
- Might having null individuals be a parameter of linguistic variation?

Zero in Ktunaxa:

- Ktunaxa uses zero robustly and it's clearly truly nativized, not a superficial borrowing.
- Independent properties of the language make hunting for null individuals tricky.
- But there may be at least some evidence for them from counting constructions.
- The term for zero is based on an absence predicate.

Absence in English and Ktunaxa:

- Ktunaxa builds its zero term from an absence predicate.
- Interestingly, not from a negative existential, which it also has.
- It and English both distinguish absence from ‘no such thing’ claims.
- In Ktunaxa, ‘no such thing’ readings can be built out of habitual absence.
- ’No such thing’ in English may make an intensional claim.

A hypothetical typology of zero, in descending order of restrictiveness:

- **No 0 degrees.** No measure functions that yield 0. Implemented this way, it would entail that no scales are lower-closed. Does this exist?
- **No null amounts.** That is, no (potentially abstract) mass individuals whose measure in amount is 0. Prediction: would lack zero with chance nouns.
- **No empty plural individuals.** Cantonese.
- **Plural null individuals but null singular individuals.** English.
- **Even singular individuals can be null.** Is this conceivable? Is there such a language?

A series of implicational universals?

Gratitude

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Is this just a presupposition?

One possible interpretation of the facts:

- Classifiers simply presuppose that their numeral argument is non-zero.

Thus:

(96) $[\![\textit{go3 ‘}\textsc{cl}\textit{.unit’}]\!] = \lambda k \,.\, \lambda n : n \neq 0 \,.\, \lambda x[\pi(k)(x) \wedge \mu_{\textbf{card}}(x) = n]$

If this were simply a presupposition, we should expect some lexical variation.

- There should be some classifiers that lack this presupposition.
- One might expect some that impose arbitrary other numerical presuppositions (exceeding 2, say).
- Conversely, there should be some unit nouns that *also* have this presupposition too, or at least a similar one.

But none of these expectations is met.

- No classifier is compatible with zero.
- No unit noun is incompatible with it.

Faced with this, one might instead suppose that $\mu_{\mathbf{card}}$ itself has a presupposition—that is, it's not defined for any individual with a zero cardinality.

But this is odd:

- Cardinality is conceptually basic. No reason to expect *different* cardinality measure functions across languages.
- Where would one 'put' such a fact? How to encode into the grammar that such a restricted cardinality function—and no other—is possible in Cantonese?

More straightforward, then, to just assume zero-membered pluralities don't exist in the ontology.

What does it mean lack null individuals?

- There are infinitely many sets that correspond to no natural language predicate denotation.
- Plural individuals are freely assembled from sets of individuals.
- Why is the null set any different in allowing this?

A way to do this, essentially Link (1983)'s:

- All atomic individuals are in D_e.
- The individual-sum forming operation is defined for any two (atomic or plural) individuals in D_e.
- The individual sum of any two individuals in D_e is also in D_e.
- Nothing else is in D_e.

(97) $D_e = Atoms \cup \{x \sqcup y : x \in D_e \land y \in D_e\}$

If $\perp$ isn't a member of *Atoms*, given this definition, D_e will not include it or null pluralities.

What happens when a language 'gets' a zero?

When a language gets a zero,

- $\perp$ is added to D_e (by stipulation)
- or, the individual-sum operation is defined à la B&N to apply to arbitrary sets and not just pairs, thereby including $\varnothing$

Appendix

Variation, lacking zero, and growing zero

How to grow a null individual

Growing null individuals might entail simply progressing on this scale. At every step, a slight redefinition of what the model looks like.

For example, growing 0 degrees would require extending the domain of degrees from (98a) to (98b):

(98) a. $D_d = \{\langle n, Dim\rangle : 0 < n \leq 1 \wedge Dim \text{ is a dimension}\}$
b. $D_d = \{\langle n, Dim\rangle : 0 \leq n \leq 1 \wedge Dim \text{ is a dimension}\}$

Growing null mass terms and null pluralities would be similar:

(99) a. $D_e = Atoms \cup \{x \sqcup y : x \in D_e \wedge y \in D_e\}$
b. $D_e = Atoms \cup \{x \sqcup y : x \in D_e \wedge y \in D_e\} \cup \bot$