

# Scope of generic and iterative verbs in Czech

experimental evidence

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- pluractionality and genericity in Czech

(1)	a.	chyt-nou-t rybu	<i>semelfactive</i>
		'to catch a fish once'	
	b.	chyt-a-t rybu	<i>iterative</i>
		'to catch fish more than once'	
	c.	chyt-áva-t rybu	<i>generic</i>
		'to catch fish regularly.'	

- this talk: experimental evidence for different scopes of genericity and iterativity

## Outline

1. Intro
2. Experiment
3. Theoretical implications

- joint work with Anna Woideová



## Theoretical background

- standard assumptions: the denotation of verbs is lexically pluralized (\*): Krifka (1992), Kratzer (2007)
  - English *arrive* denotes the set of all singular and plural events
- first approximation (non-formally stated in the traditional grammar: Kopečný (1962))
  - semelfactivity: the verb denotes a single event
  - iterativity + genericity: the verb denotes a set of plural events
  - the debate in the 60s: derivational or inflectional morphology
- agreement in the traditional grammars: one of the aktionsarts (next to ingresses, delimitatives, distributives, etc.)

## Slavic languages

- in Czech (and Slovak), both iterativity and genericity are productive, unlike in Russian, Polish, or other Slavic languages: Nübler (2017)
- the traditional grammars don't distinguish between iterativity and genericity, though (umbrella term: *iterativity*) – Nübler (2017), Kosek (2014)
- Filip (2017) (a.o.): genericity is a separate category

- clear differences:
  - iterative verbs: can be used in the present tense with the pure pluractional meaning
  - generic verbs: not

(2) Petr právě teď {chytá/\*chytává} ryby.  
 Petr just now catchesIT.3SG/catchesGEN.3SG fishes  
 'Petr is catching fishes right now.'

- corpus evidence: pure imperfective (and also iterative) verb *dělat* is the 120th most frequent verb in the Czech National Corpus, while the generic verb *dělávat* is the 5147th most frequent verb (similarly for *mluvit* vs. *mluvívat*)

- diachronic evidence: in Diakorp v6 regex search for a generic version of verbs *dělávat* 'to do regularly' and *hubívat* 'to kill regularly' yields 6 hits, the earliest from 1573
- unlike that the imperfective/iterative versions *dělat/hubit* yields 576 hits starting in 1350 with around 50 hits from the beginning of 15th century and earlier
- good evidence for: iterativity is more basic and less marked than genericity
- genericity is more specific and less frequent

## Formal semantics of pluractionality: basic assumptions

- operators vs. filters for event plurality:

(3) a. operators:  $\{a, b, c\} \rightarrow \{a, b, c, a \oplus b, b \oplus c, a \oplus c, a \oplus b \oplus c\}$   
b. filters:  $\{a, b, c, a \oplus b, b \oplus c, a \oplus c, a \oplus b \oplus c\} \rightarrow \{a \oplus b, b \oplus c, a \oplus c, a \oplus b \oplus c\}$

- operators (binominal/adverbial *each*, e.g.) sum together events: Zimmermann et al. (2002), Champollion (2016)
- filters (pluractionals, distributive/dependent numerals) restrict the plural set of events: Lasersohn (2013), Cable (2014) Kuhn (2017), Kuhn and Aristodemo (2017), Kuhn (2019)



## One distinction between operators and filters

- operators can have wide or narrow scope with respect to plain indefinites:

(4) Every teacher examined one student.  $\forall > \exists / \exists > \forall$

- but filters allow only a narrow scope:

(5) JEAN ONE WORD FORGET-rep.  $\exists > \forall$   
'Jean forgot one word repeatedly.' Kuhn and Aristodemo (2017)

- pre-experimental intuition: Czech generic verbs allow both narrow and wide scope w.r.t. indefinites
- Czech iterative verbs allow only narrow scope w.r.t. indefinites
- if true, generic verbs should be more similar to operators than filters
- and iterative verbs should be more similar to filters than operators

- that would fit well with Filip's analysis of Czech generic verbs as dyadic operators (quasi-universal force with obligatory exceptions)
- while Czech iterative verbs would be treated as filters

## Research question

- (6) Do Czech generic verbs allow wide scope w.r.t. indefinites?
  - a. Do they differ from Czech iterative verbs in this respect?
- positive answer: empirical evidence for treating generic verbs as operators and iterative verbs as filters



- acceptability judgment task with 3 conditions: in a context strongly favoring narrow scope of the indefinite:

Day	Fish
Monday	Salmon
Tuesday	Trout
Wednesday	Bass
Thursday	Catfish
Friday	Tuna
Saturday	Cod
Sunday	Mackerel

- expectations (if generics are not iteratives):

Condition	Rating
perf	good
plur	the worst
gen	worse

- experiment run online on L-rer: Starschenko and Wierzba (2024)
- 118 participants (without any compensation)
- 3 conditions: 9 items (1x3 Latin square)
- 9 fillers (bad: wide scope out of islands, good: wide scope out of non-islands) – again acceptability judgment task with context
- 1 to 7 Likert scale (1 = the worst, 7 = the best)
- 20 participants excluded (criterium: more than 4 points mean difference between good and bad fillers)
  - 98 participants in the final analysis



## Descriptive statistics

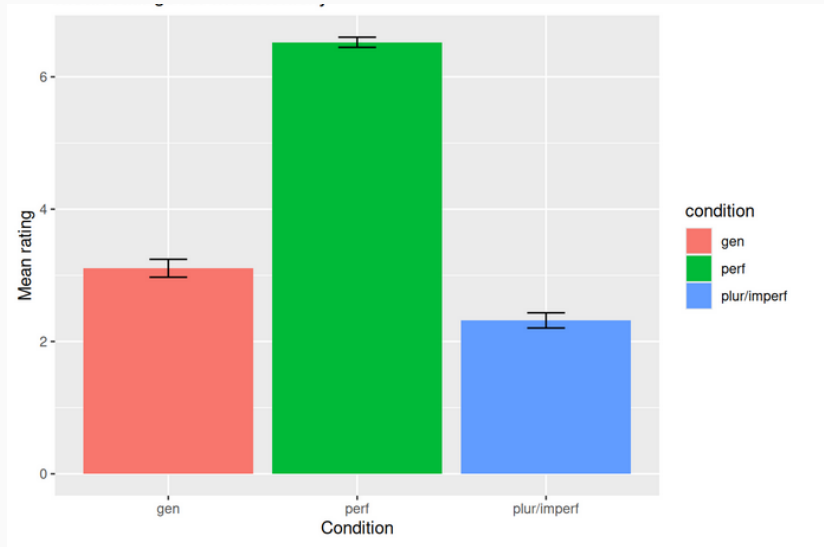


Figure 1: Barplot with standard errors

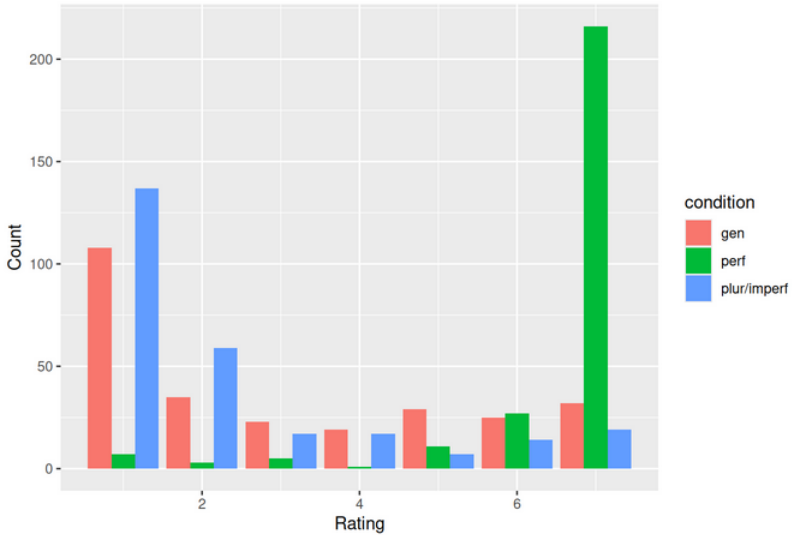


Figure 2: Distribution of ratings

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Condition	Mean	Median	SE
gen	3.11	2	0.14
perf	6.52	7	0.08
plur/imperf	2.32	1	0.12

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## Inferential statistics

- Bayesian hierarchical model (in rstanarm: Goodrich et al. (2023)) with one fixed effect (condition) and random intercepts for participants and items
  - The full random effects model didn't converge
- the model was run with default priors and 4 chains with 2000 iterations each (default)
- the condition plur/imperf was treated as a reference level
  - plur/imperf: part of the verbs were pure iterative, part ambiguous between imperfective and iterative (but statistically, the parts were not credibly different)

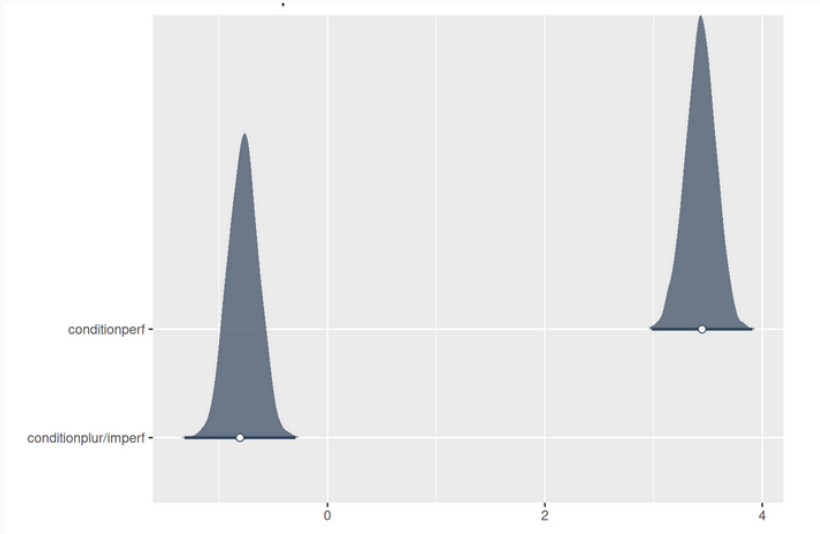


Figure 3: Posterior distribution of the fixed effect

Parameter	Median	95% CI	ROPE	% in ROPE	BF
(Intercept)	3.09	[2.78, 3.42]	[-0.26, 0.26]	0%	8.39e+14
conditionperf	3.43	[3.14, 3.70]	[-0.26, 0.26]	0%	4.71e+21
conditionplur/imperf	-0.77	[-1.05, -0.50]	[-0.26, 0.26]	0%	365.86

## Discussion

- the differences between the baseline and the other two conditions are credibly different:
  1. perfective semelfactives are 3.5 points better than generic verbs
    - Bayes factor in favor of the existence of the difference:  $4.71e+21$  (extreme evidence)
  2. iteratives are 0.8 points worse than generic verbs
    - Bayes factor in favor of the existence of the difference: 366 (also extreme evidence)
- in traditional terms, the probability of zero hypothesis (no difference between iteratives and generics) is extremely low

- answers to the research questions:

(8) Do Czech generic verbs allow wide scope w.r.t. indefinites?

a. Do they differ from Czech iterative verbs in this respect?

- Czech generic verbs allow wide scope w.r.t. indefinites
- they differ from Czech iterative verbs: the latter allow only narrow scope w.r.t. indefinites



## First steps to formalization

- iteratives are filters that restrict the set of events to pluralities
- they require distribution across time (not participants):

(9) Petr kých-a-l.  
Petr sneeze-ITER.3SG-PAST  
'Peter sneezed (repeatedly).'

- and as filters they are unable to pluralize/make sum of events → the cardinality of the indefinite requires the denotation of the indefinite to be singular

- in this respect (distribution over time), they seem to differ from Czech dependent numerals (also filters), which require distribution across participants:

(10) {#Jeden tým/Oba týmy} získal(y)  
 one team.SG.NOM both teams.PL.NOM get.PL.PAST  
 po dvou bodech.  
 after two points.PL.LOC  
 'One team/Both teams got two points each.'

- generic verbs are operators that sum together events
- in this respect they are close to universal quantifiers
- the sum of events allows the multiplicity of the indefinite's denotation
  - only the atomic sub-events retain their singular denotation

## Pieces of formalization

- neo-Davidsonian event semantics: Champollion (2015)
- thematic roles as constituents with NPs:

$$(11) \quad \llbracket \text{one fish Th} \rrbracket = \lambda V \lambda e [V(e) \wedge \text{theme}(e) \in \llbracket \text{fish} \rrbracket \wedge |\text{theme}(e)| = 1]$$

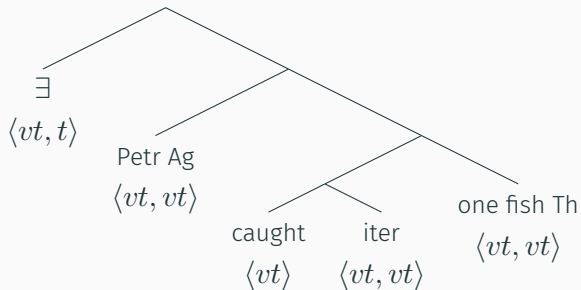
- lexical denotation of verbs is inherently pluralized: Krifka (1992), Kratzer (2007)

## Filters

- the filters are interpreted as cardinality requirements: Kuhn and Aristodemo (2017), Kuhn (2019)
- the filter distributing over times (after Kuhn and Aristodemo (2017)):

$$(12) \quad \llbracket \text{iterative} \rrbracket = \lambda V \lambda e [V(e) \wedge \exists e', e'' \leq e [\tau(e') \neq \tau(e'')]]$$

- input: verb denotation  $V$
- output: the set of V-ing events with at least two events with distinct times



$$(13) \quad \exists e[*caught(e) \wedge \exists e', e'' \leq e[\dots] \dots |theme(e)| = 1]$$

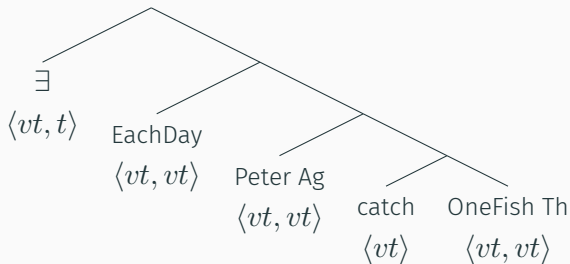
- formalization of the conditions iter/imperf from Experiment
- the event is checked for a plurality (at least two events with distinct times), but the cardinality of the theme clashes with the context, forcing the dependency of the indefinite on days/events

## Operators

- operators are interpreted as summing together events (again after Kuhn and Aristodemo (2017))
- Kuhn & Aristodemo's definition shortened and adapted:
- quantification over times: as temporal location theta-role

$$(14) \quad \llbracket \text{each TempLoc} \rrbracket = \lambda V \lambda e [\exists E [e = \bigoplus E] \forall x [atom(x) \rightarrow \exists ! e' [e' \in E \wedge V(e') \wedge TempLoc(e') = x]] \wedge \forall e' [...]] \rightarrow$$

- input: verb denotation  $V$
- output: the set of events (sum)  $e = \bigoplus E$ : for each atomic time there is a subevent  $e'$  of V-ing and vice versa



$$(15) \quad \exists e[\exists E[e = \bigoplus E \wedge \forall x[atom(x) \rightarrow \exists!e' [|theme(e')| = 1 \dots]]]]$$

- formalization of the conditions perf from Experiment
- explains the narrow scope of the indefinite: the sum of events has subevents in which each has the cardinality 1, but their sum is plural
- compatible with the context
  - the verb should be singularized

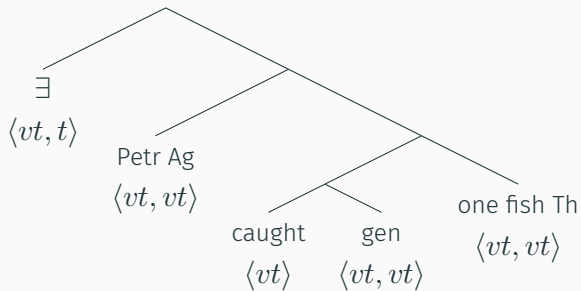


## Generic operators

- let's assume some dyadic generic operator (Filip's universal force with exceptions) in the template of Kuhn & Aristodemo's each operator:

$$(16) \quad \llbracket \text{Gen} \rrbracket = \exists e [\exists E [e = \bigoplus E \wedge \text{Gen}[\dots][\dots]]]$$

- similar to each operator but with a more nuanced quantification force



$$(17) \quad \exists e[\exists E[e = \bigoplus E \wedge Gen[\dots][\dots]]]$$

- the formalization of the condition gen from Experiment
- in restrictor, the subjects had to fill in the atoms (days of the week) pragmatically
- that can be one of the reasons why the generic verbs were rated lower than the perfective verbs

## Interim summary

- the different scopal properties of generic and iterative verbs (w.r.t. indefinites) can be captured by the different formal semantics of the generic and iterative morphology
- in a nutshell: generic verbs are operators (summing together events), while iterative verbs are filters (restricting the set of events)
- overt operators (quantifiers over time) were accepted best in the context (condition perf)
- gen was accepted worse (possible reason: pragmatical filling in of the restrictor)
- iter was accepted the worst: the cardinality of the theme clashed with the context

## Further implications

### Compatibility with the universal quantifiers

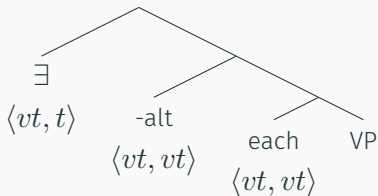
- both generic verbs and iteratives are compatible with the universal quantifiers:

(18) Petr každý den  
Petr every day  
{chyt-a-l/chyt-áva-l} ryby.  
catch-ITER.3SG-PAST/catch-GEN.3SG-PAST fishes  
'Peter caught fish every day (repeatedly/regularly).'

- the iter operators are in the scope of the universal quantifier, but they can be interpreted vacuously
- the cardinality check of the filter seems to be vacuous in this case

Kuhn & Aristodemo's solution:

- scopable plurality (for pluractionals “-alt” in sign language): Kuhn and Aristodemo (2017)



- the scope of  $gen$  in Czech would also seem to require access to the whole TP (not only V)
- if true, then the difference between  $gen$  and  $iter$  is not configurational but interpretational

## Prediction 1

- the interaction of generic verbs with quantifiers over time should be different from the interaction of iteratives with quantifiers over time
  - intuitions point in that direction but need further testing

- (19) V těch letech vždycky ráno, maminka líbala  
in those years always morning, mother kissed-Iter  
své dvě děti.  
her two children  
'In those years, every morning, the mother kissed her two children  
(repeatedly).'
- (20) V těch letech vždycky ráno, maminka líbávala  
in those years always morning, mother kissed-Gen  
své dvě děti.  
her two children  
'In those years, every morning, the mother kissed her two children  
(regularly each more than once).'

## Prediction 2

- sum operation: cumulative readings of generic verbs (analogous to the cumulative readings of universal quantifiers)
- if in the scope of another plurality expression: (21) vs. (22) from Haslinger and Schmitt (2018)
- if it does exist, it can complicate the previous prediction

(21) Every girl in this town fed (the) two dogs.

a. SCENARIO: Ada fed Carl and Dean. Bea fed Carl and Dean. true

b. SCENARIO: Ada fed Carl. Bea fed Dean. false

(22) The two girls in this town fed (the) two dogs.

a. SCENARIO: Ada fed Carl and Dean. Bea fed Carl and Dean. true

b. SCENARIO: Ada fed Carl. Bea fed Dean. true

- first attempt to test the prediction: PLUR > ITER vs. ITER > PLUR

- (23) a. Petr a Karel skák-a-li (každý  
 Petr and Karel jump-ITER.3PL-PAST (every  
 jednou).  
 once)  
 'Peter and Karel jumped (each once)'
- b. Maminka líb-a-la Marušku a  
 mother kiss-ITER.3SG-PAST Maruška and  
 Honzíka (každého jednou).  
 Honzík (each once)  
 'Mother kissed Maruška and Honzík (each once)'

- complicated by the extremely weak truth conditions of the iteratives



### Prediction 3

- homogeneity: according to Križ (2017), Russian dependent numerals are interpreted as homogenous (unlike Hungarian dependent numerals):

- (24) The girls danced.
- a. true iff all the girls danced.
  - b. false iff none did.
  - c. undef. iff some, but not all did.

(25) Mal'čiki vypili po butylke.  
boys drank PO bottle  
'The boys each drank a bottle.'

- if true (intuitions are not clear to me), iterative verbs should be more similar to Czech dependent numerals (homogenous) than generic verbs

## Open questions

- exact nature of the iterativity: distribution only over times?
- relation of the interpretation to the morphosyntax:
  - the scope of gen should be semantically higher than iterative
    - because of restrictor and scope
  - but scope of the iterative is expected to be high according to Kuhn and Aristodemo (2017)

Thank you for your attention!

- Cable, Seth. 2014. “Distributive Numerals and Distance Distributivity in Tlingit (and Beyond).” *Language*, 562–606.
- Champollion, Lucas. 2015. “The Interaction of Compositional Semantics and Event Semantics.” *Linguistics and Philosophy* 38: 31–66.
- . 2016. “Overt Distributivity in Algebraic Event Semantics.” *Semantics and Pragmatics* 9: 16–11.
- Filip, Hana. 2017. “Genericity and Habituality.” Unpublished manuscript. Düsseldorf: Heinrich Heine University Düsseldorf.
- Goodrich, Ben, Jonah Gabry, Imad Ali, and Sam Brilleman. 2023. “Rstanarm: Bayesian Applied Regression Modeling via Stan.” <https://mc-stan.org/rstanarm/>.

- Haslinger, Nina, and Viola Schmitt. 2018. "Scope-Related Cumulativity Asymmetries and Cumulative Composition." In *Semantics and Linguistic Theory*, 197–216.
- Kopečný, František. 1962. *Slovesný Vid v Češtině*. Praha: Nakladatelství Československé akademie věd.
- Kosek, Pavel. 2014. *Historická Mluvnice češtiny*. Masarykova univerzita Brno.
- Kratzer, Angelika. 2007. "On the Plurality of Verbs." *Event Structures in Linguistic Form and Interpretation* 269 (300): 2.
- Krifka, Manfred. 1992. "Some Remarks on Polarity Items." *Semantic Universals and Universal Semantics*, 150–89.

- Križ, Manuel. 2017. "In Soviet Russia, Alcohol Is Dependent on You." *Festschrift for Martin Prinzhorn. Wiener Linguistische Gazette (WLG)* 82: 173–80.
- Kuhn, Jeremy. 2017. "Dependent Indefinites: The View from Sign Language." *Journal of Semantics* 34 (3): 407–46.
- . 2019. "Pluractionality and Distributive Numerals." *Language and Linguistics Compass* 13 (2): e12309.
- Kuhn, Jeremy, and Valentina Aristodemo. 2017. "Pluractionality, Iconicity, and Scope in French Sign Language." *Semantics and Pragmatics* 10 (6): 1–49.
- Lasersohn, Peter. 2013. *Plurality, Conjunction and Events*. Vol. 55. Springer Science & Business Media.
- Nübler, Norbert. 2017. "Iterativnost." In.

- Starschenko, Alexej, and Marta Wierzba. 2024. “L-Rex Linguistic rating experiments [software], version 1.0.3.” <https://github.com/2e2a/l-rex/>.
- Zimmermann, Malte et al. 2002. *Boys Buying Two Sausages Each: On the Syntax and Semantics of Distance-Distributivity*. Vol. 62. LOT Utrecht.