All notional mass nouns are count nouns in Yudja

Suzi Lima

Harvard University

lima@fas.harvard.edu

Count/mass distinction: background

Signature property: mass nouns do not combine directly with numerals: * three bloods

Elasticity: nouns can be coerced in restricted scenarios (three beers)

The mapping property: in a language L, substances are coded as mass by tests prevailing in L (blood). Objects however are not necessarily coded as count nouns (furniture).

(Chierchia 2010)

Count and mass nouns: pattern 1

- Count/mass typology: numerals **cannot** be directly combined with mass nouns:

Pattern 1: a container/measure phrase is required:

English (number marking language)

* Three meat Three **pounds of** meat

Dene Suliné (number neutral language)

* Solaghe	bër	Aolaghe	**nedadhi**	bër
five	meat	five	pound	meat
		'Five pounds of meat'		

(Chierchia 1998, 2010, Wilhelm 2008)

Count and mass nouns: pattern 2

Pattern 2: a classifier is required:

Mandarin (Classifier language)

* San rou

three meat

San **bang** rou

three CL meat

'Three pounds of meat'

(Cheng and Sybesma 1999, Chierchia 2010)

Count and mass nouns: pattern 3

Pattern 3: all nouns can be directly combined with numerals:

Yudja (number neutral language)

Txabïu	ali	wãnã
three	child	ran

'Three children ran'

Count and mass nouns: pattern 3

Pattern 3: all nouns can be directly combined with numerals:

Yudja (number neutral language)

Context: Maria brought three bowls of rice:

Maria	txabïu	awatxi'i	dju wï
Maria	three	rice	bring

'Maria brought three (bowls of) rice'

Count and mass nouns: pattern 3

Pattern 3: all nouns can be directly combined with numerals:

Yudja (number neutral language)

Context: Maria was serving rice for the children and while she was doing that three small portions of rice fell over the chair:

Maria	txabïu	awatxi'i	apa
Maria	three	rice	drop/fall

'Maria dropped three (portions of) rice'

Goals of this talk

① Based on experimental studies, show that all nouns have count denotations in Yudja

② Propose that any noun in Yudja denote a set of maximally strongly connected entities (Casati and Varzi 1999, Grimm 2012), closed under sum formation.

The Yudja people

- 348 people
- Yudja is the only language Yudja speakers use in the community
- Adults are bilinguals or multilinguals

The Yudja people

- Yudja people: 6 villages
- Xingu Indigenous Territory
- Mato Grosso (Brazil)

Xingu River (credit: Pedro Martinelli)

Properties of the Yudja language

Property 1: all nouns can be directly combined with numerals

Property 2: container phrases (*bags, bottles*) are interpreted as locatives

Property 3: all nouns can be combined with count quantifiers (such as *many*)

Property 1: numerals

- All nouns can be directly combined with numerals:

Pïza
'canoe'
Notional
count noun

Txabïu pïza dju wï
three canoe bring
'(Someone) brought three canoes'

Apeta
'blood'
Notional
mass noun

Context: a nurse from Diauarum brought 3 tubes of blood to the Tuba Tuba village:

Txabïu apeta dju wï
three blood bring
'(Someone) brought three (portions of) blood'

Property 2: locative-container phrases

① No classifiers or measure words (*liter, kilo*);

② Container nouns (*bags, bottles*):

Anana	txabïu	awïla	wï
Anana	three	honey	bring

'Anana brought three (portions of) honey'

Anana	txabïu	awïla	**karaha**	**he**	wï
Anana	three	honey	bottle	in	bring

'Anana brought three bottles of honey'

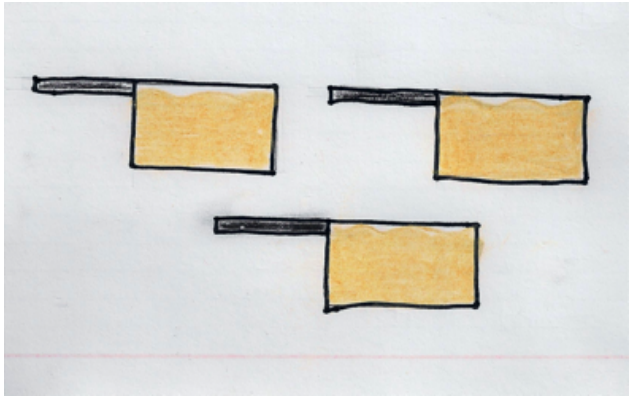
lit.: 'Anana brought three (portions of) honey in bottles'

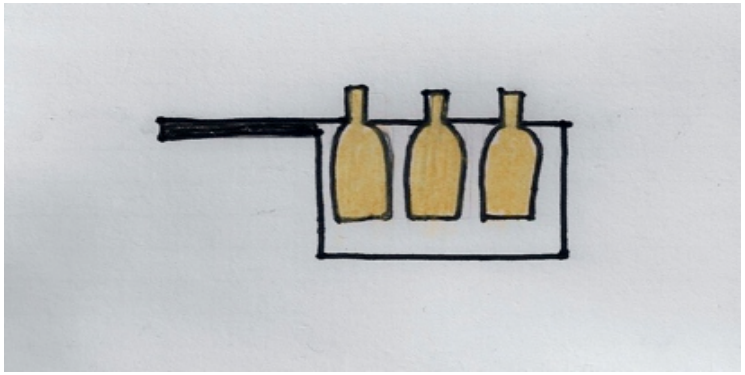
Container nouns: locatives

- Locative interpretation
- Do not necessarily determine the counting unit (comprehension studies; 20 adults and 28 children)

Property 2: locative-container phrases

Txabïu	awïla	wã'ẽ	he	dju wï
three	honey	pan	in	bring





Counting unit: pans
Location: pans

Counting unit: bottles
Location: a pan

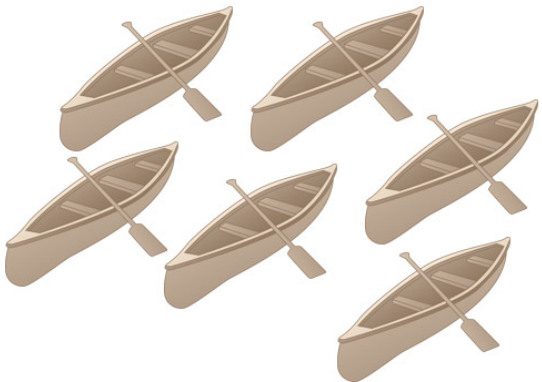
Property 3: count quantifiers

Count quantifiers:
1) combine with all nouns;
2) 'Number' interpretation.

Pïza 'canoe' - (notional) **count**

Itxïbï	pïza	dju wï
many	canoe	bring

'(Someone) brought many canoes'



Property 3: count-quantifiers

Count quantifiers:
1) combine with all nouns;
2) 'Number' interpretation.

Asa 'flour' - (notional) **mass**

Itxïbï	asa	dju wï
many	flour	bring

'(Someone) brought many (portions of) flour' **(✔number)**
'Someone brought a big portion of flour' **(✖ volume)**

Hypothesis: all nouns are count in Yudja

- Basic denotation: kinds

[[apï]] = λ w. DOG(w) [[apï]] = DOG

- The property of being an atomic part of the kind DOG:

KO (Kinds to Objects)

(2a) KO = λ k: k $\in$ K. λ x. λ w. AT*(w)(x)(k)

(2b) KO([[apï]]) = λ x. λ w. AT*(w)(x)(DOG)

AT* = maps an individual x, a world w and a kind k to the truth value 1 if and only if x is an atomic part of k(w) or is the sum of atomic parts of k(w)

Based on Carlson (1997), Chierchia (1998), Krifka et al. (1995)

Hypothesis: all nouns are count in Yudja

- Individuals that belong to a kind are portions of that kind

- Example: a puddle of water is a portion of the kind **WATER** and a man is a portion of the kind **MAN**.

Atoms: maximal self-connected portions of a kind

- Atomic members of a kind are defined **as maximally self-connected portions**

Maximal self-connected portion of a kind in a world of evaluation:
$MSC(x)(k)(w) =_{def} SC(x) \ \& \ x \leq k(w) \ \& \ \neg \ \exists y \ [\ x < y \ \& \ SC(y) \ \& \ y \leq k(w) \ ]$

- A maximal self-connected portion of a kind cannot be a proper part of another self-connected portion of a kind.

Based on Casati and Varzi (1999)
Grimm (2012)

Atoms: maximal self-connected portions of a kind

- Atomic members of a kind are defined **as maximally self-connected portions**

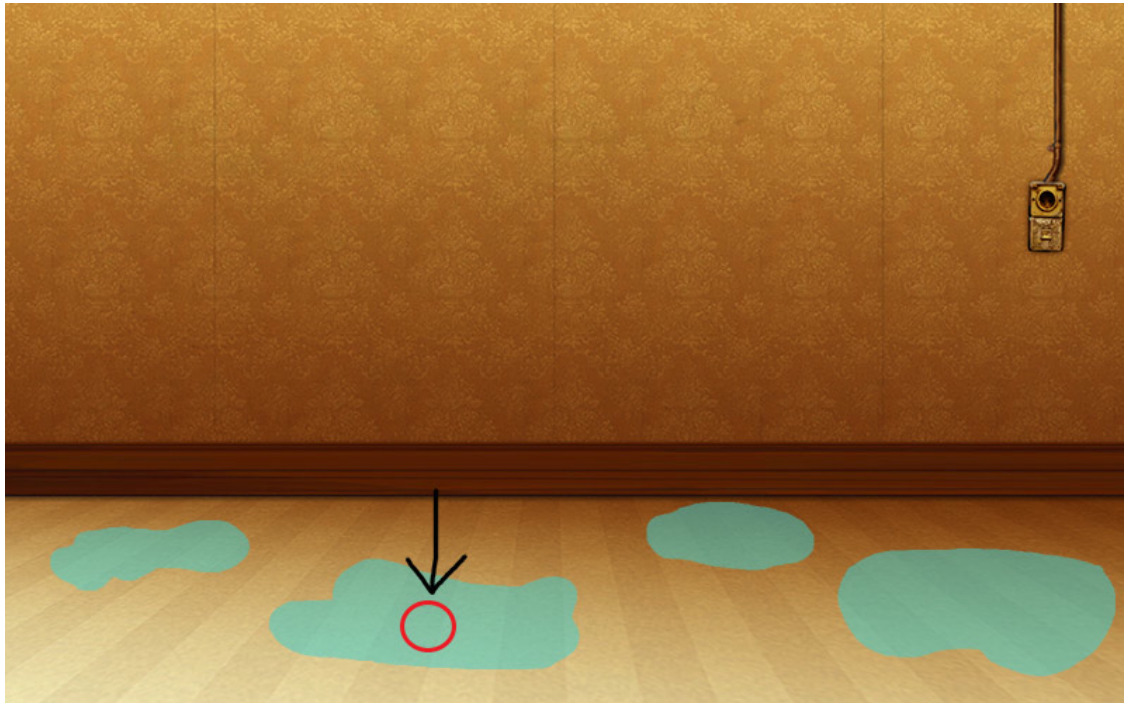
- A maximal self-connected portion of a kind cannot be a proper part of another self-connected portion of a kind.

Maximal self-connected portions of water

Duwadjuse y'a a'i
Four water here
'There are four (portions of) water here'

Based on Casati and Varzi (1999)
Grimm (2012)

Atoms: maximal self-connected portions of a kind



A part of a maximal self-connected portion of water cannot be counted as an atom.

Atoms: maximal self-connected portions of a kind

Condition on atomicity:

An entity *x* is an atomic portion of a kind *k* in a world *w* only if *x* is a maximal self-connected part of *k*(*w*).

Analysis: predictions

Prediction 1: *quantity judgment studies*

When asked "who has more x?"speakers will base their answers on **number** of concrete portions instead of volume.

Prediction 2: *count quantifiers*

A count quantifier - *itxïbi* 'many' - will be interpreted as quantifying over the number of concrete portions of x.

Prediction 3: *size adjectives*

A size adjective - *urahu* 'big' - will introduce the property of being big to a concrete portion of x (for nouns like y'a 'water').

Quantity judgments in Yudja

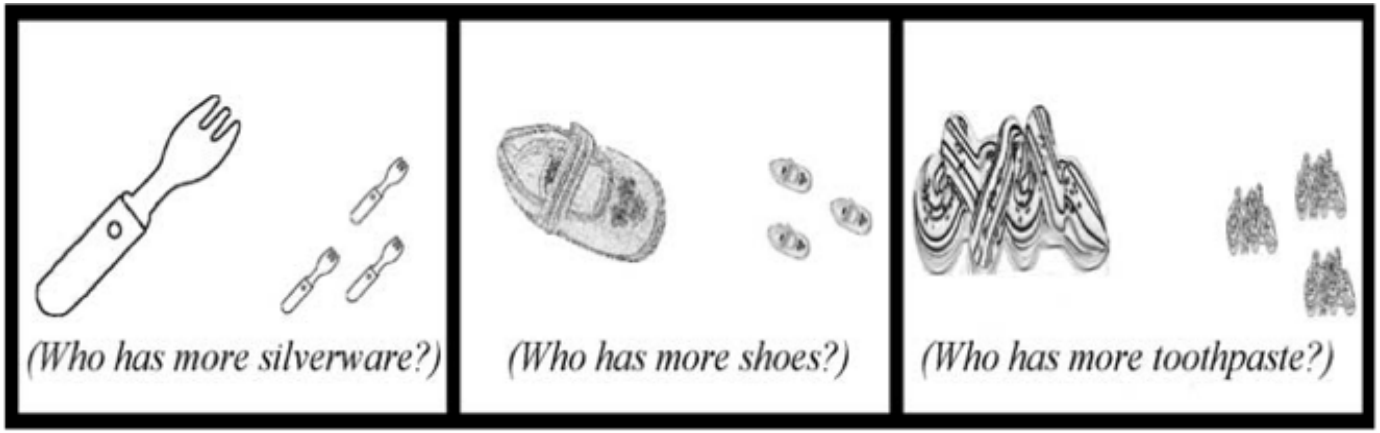
Prediction 1: If all nouns are count in Yudja, when asked "who has more x?"speakers will base their answers on **number** of concrete portions instead of volume.

Quantity judgments in English: background (Barner and Snedeker 2005)

Participants: 16 adults; 16 children (4;1–4;6)

Methodology: Who has more x?

Study 1: a big portion of x (**Volume**) vs. many different portions of x (**Number**):



Quantity judgments in English: background

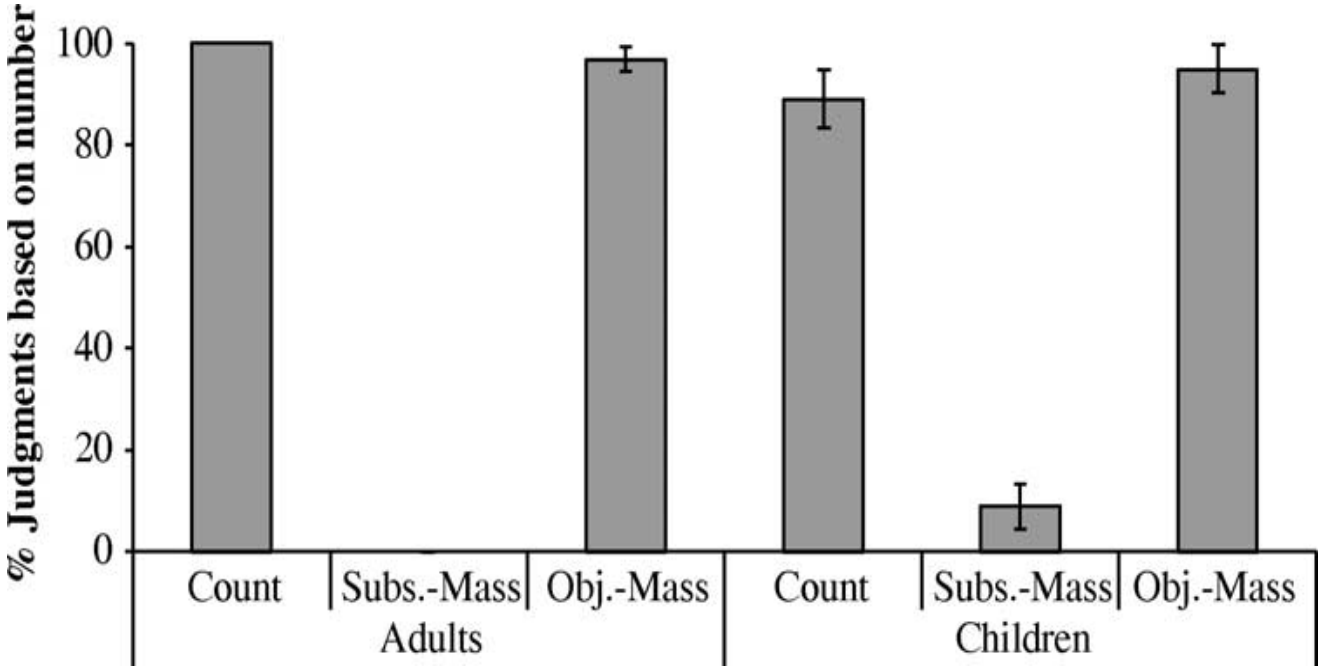


Fig. 2. Adults' and children's quantity judgments, as a percentage of judgments based on number of individuals.

Barner and Snedeker 2005

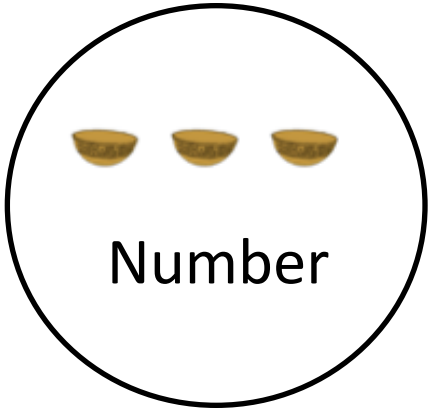
Quantity judgments in Yudja: Study 1

Participants: 18 adults and 22 children (7, 3-to-5-year-old children; 15, 6-to-11- year-old children);

Notional count nouns (*xãã* 'bowl', *txarina* 'chicken', *karaxu* 'spoon'):

Ma de bitu xaa dju a'u
who more bowl have
'Who has more bowl(s)?'

Volume



Expected answer: Number (three bowls)

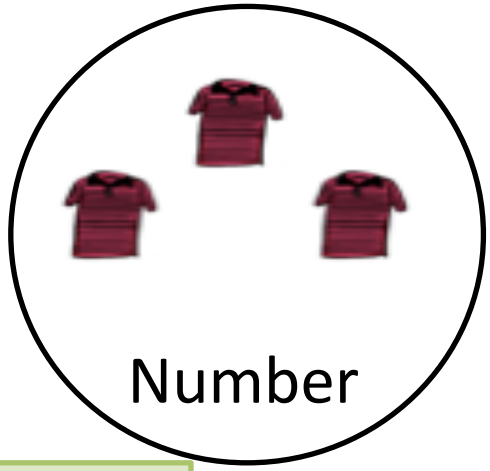
Quantity judgments in Yudja: Study 1

Aggregate nouns (*abeata* 'clothes', *wã'e* 'ceramics'):

Ma de	bitu	abeata	dju a'u
who	more	clothes	have

'Who has more cloth(es)?'

Volume



Number

Expected answer: Number (three shirts)

Quantity judgments in Yudja: Study 1

Notional mass nouns (*asa* 'flour', *y'a* 'water', *kania atxa* 'meat'):

Ma de	bitu	asa	dju a'u
who	more	flour	have

'Who has more flour?'

Volume

Number

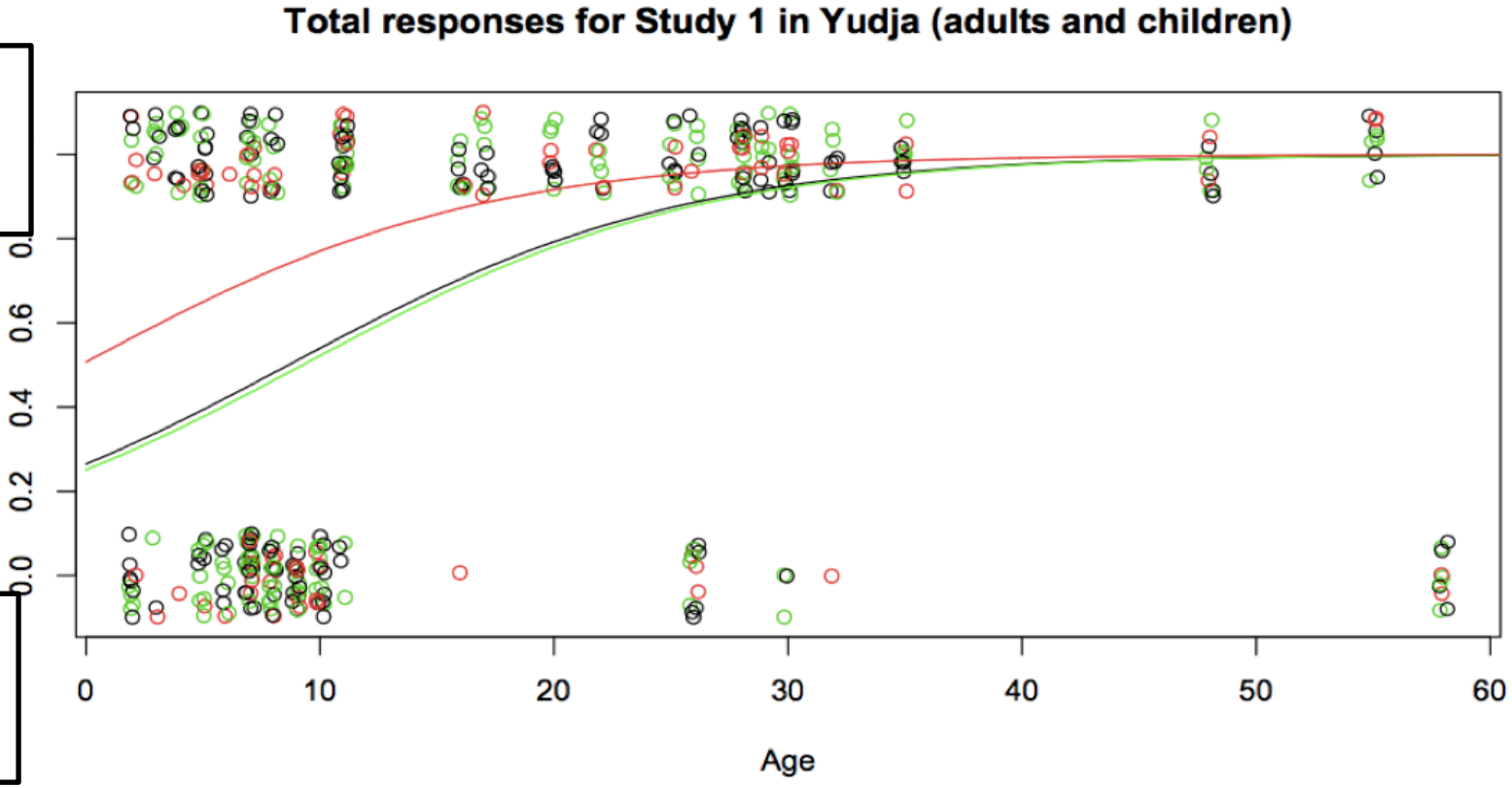
Critical:
Expected answer (if all nouns are count): Number (three piles of flour)

Quantity judgments in Yudja: Results

Mixed effects modeling using Helmert contrasts: 1) no effect of noun type; 2) effect of age on proportion of 'Number' responses (Wald's Z = 2.5, p = 0.01, β = 0.122).

Number = 1

Volume = 0



Where: **black** = (notional) count nouns; **green** = (notional) mass nouns; **red** = aggregate nouns.

Summary: Quantity judgments studies and first prediction

Prediction 1: If all nouns are count in Yudja, when asked "who has more x?"speakers will base their answers on **number** of concrete portions instead of volume.

Confirmed: all nouns can be treated as count (given the significant probability of 'Number' responses for all nouns).

Bilingualism in Yudja communities

① Most adults are bilinguals (Yudja and Brazilian Portuguese) or multilinguals (Yudja, Brazilian Portuguese and another indigenous language spoken in the Xingu Indigenous Territory)

② Gender and age influence proficiency in Brazilian Portuguese.

Brazilian Portuguese (BP): count/mass distinction

- BP(number-marking language): grammatically distinguish count from mass nouns

Plural:	Cachorro/Cachorros	'Dog/Dogs'	(count)
	Farinha/* Farinhas	'Flour/* Flours'	(mass)
Numeral:	Três cachorros	'Three dogs'	(count)
	* Três carnes	* 'Three meats'	(mass)

Will bilingual Yudja adults be sensitive to the grammatical differences between Yudja and Brazilian Portuguese?

Quantity judgments in Brazilian Portuguese: Yudja bilingual adults

Participants:

Test group: 20 Yudja adults (Brazilian Portuguese: L2)

Control group: 38 Brazilian Portuguese adults (L1)

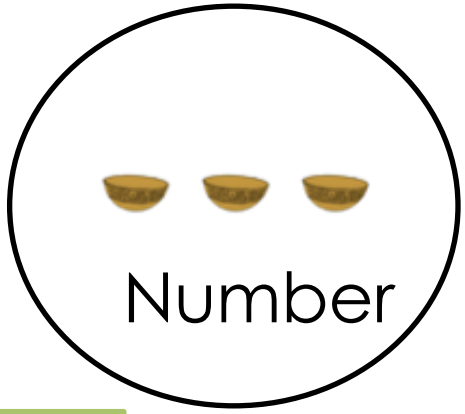
Materials: Study 1 (in Brazilian Portuguese)
Bare singulars (mass syntax)

Quantity judgments in Brazilian Portuguese: Study 2

Count nouns (*cuia* 'bowl', *galinha* 'chicken', *colher* 'spoon'):

Quem tem mais cuia
who have more bowl
'Who has more bowl(s)?'

Volume



Number

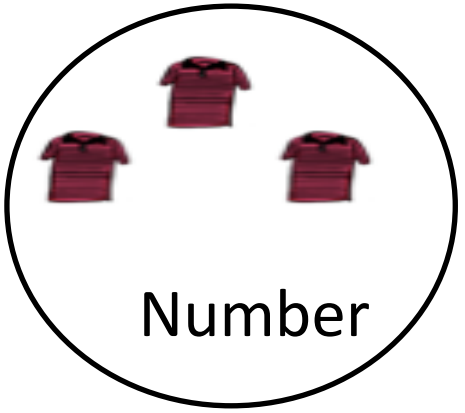
Expected answer: Number (three bowls)

Quantity judgments in Brazilian Portuguese: Study 2

Aggregate nouns (*roupa* 'clothes'; *mobília* 'furniture'):

Quem tem mais roupa
Who has more clothes
'Who has more cloth(es)?'

Volume



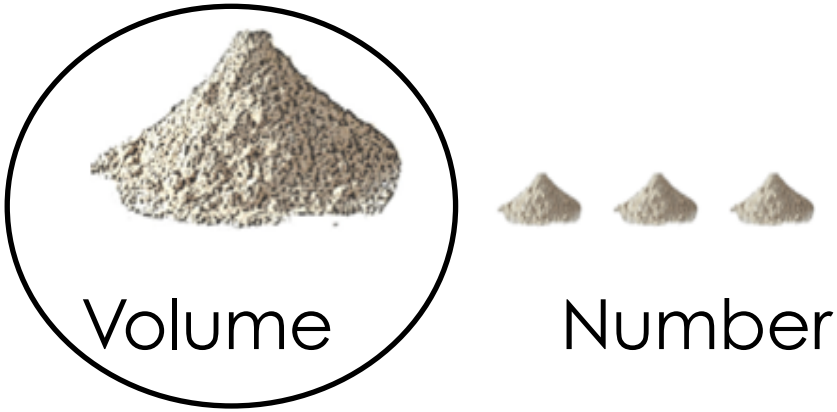
Number

Expected answer: Number (three shirts)

Quantity judgments in Brazilian Portuguese: Study 2

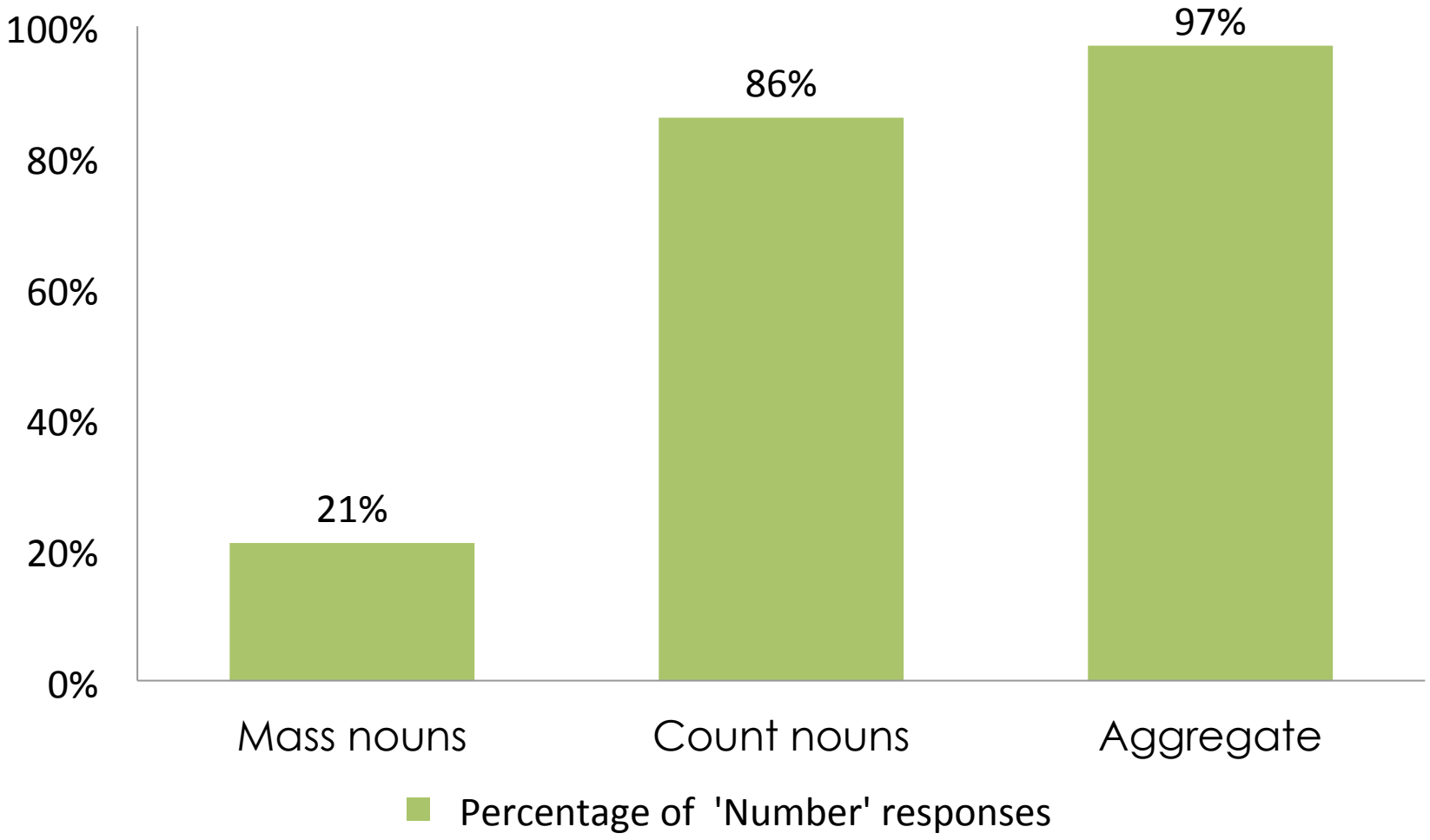
Mass nouns (*farinha* 'flour', água 'water', *carne* 'meat'):

Quem tem mais farinha
who has more flour
'Who has more flour?'



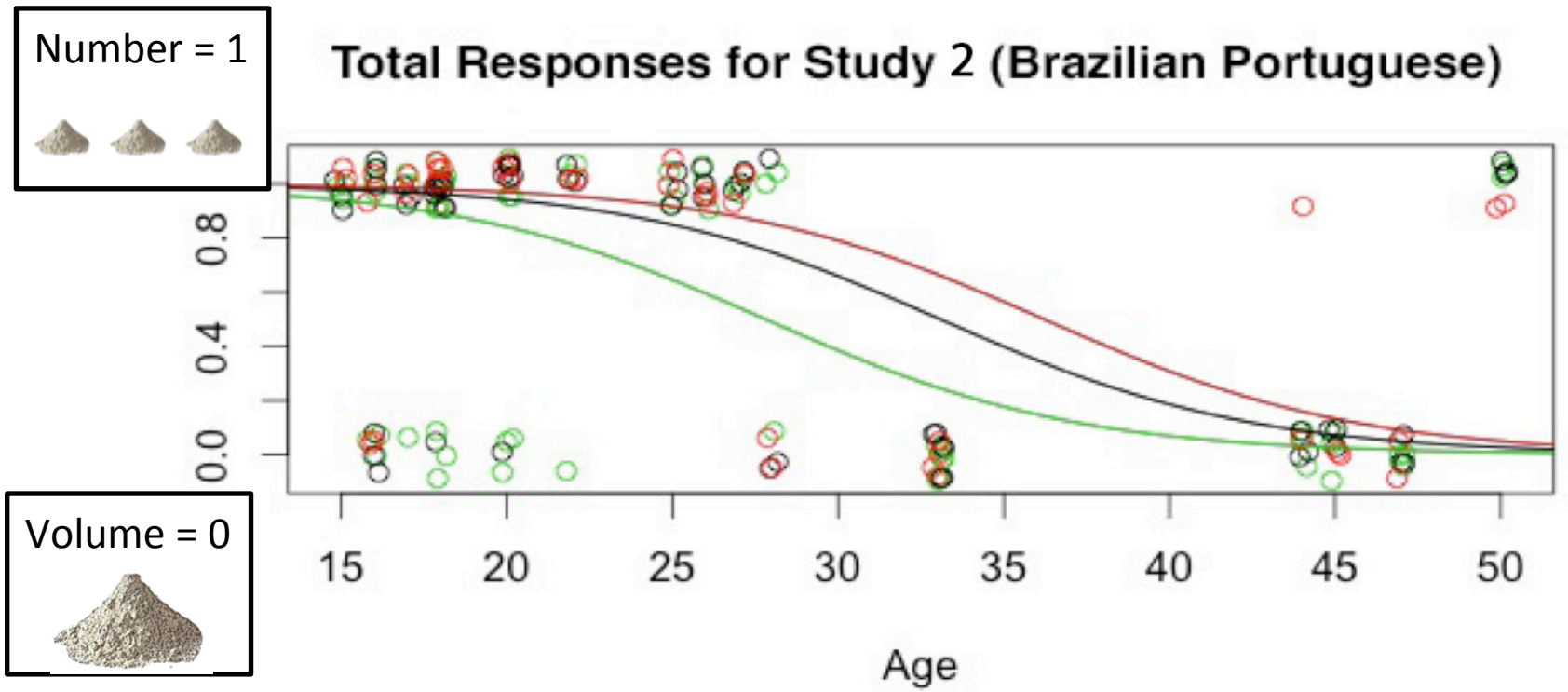
Critical:
Expected answer: Volume (big pile of flour)

Study 2: results (control group)



Study 2: results (test group)

Noun type effect: mass nouns are significantly less likely to be associated with 'Number' (Wald's Z = -2.256; p = 0.02408; β = - 0.48)
Age effect: younger bilingual speakers tend to differentiate count from mass nouns in most trials in contrast to older bilingual speakers (Wald's Z = - 2.33; p = 0.19; β = - 0.21).



Black = count nouns **Green** = mass nouns **Red** = aggregate nouns.

QUANTITY JUDGMENT STUDIES IN BP: SUMMARY

- Yudja speakers present different quantity judgments in Yudja and Brazilian Portuguese.

- Thus, Yudja speakers are sensitive to the fact that in Brazilian Portuguese but not in Yudja count and mass nouns are two different grammatical classes of nouns.

QUANTITY JUDGMENT STUDIES IN BP: SUMMARY

- **Yudja and Brazilian Portuguese**: the criteria of individuation of notional mass nouns are flexible.
- **Yudja**: notional mass nouns have count denotations and concrete portions of a kind can count as an atom.
- **Brazilian Portuguese:** a container/measure phrase determines the counting unit (atom) in order to a mass noun interact with the counting system.

Predictions 2 and 3: count quantifiers and volume adjectives

Prediction 2: *count quantifiers*

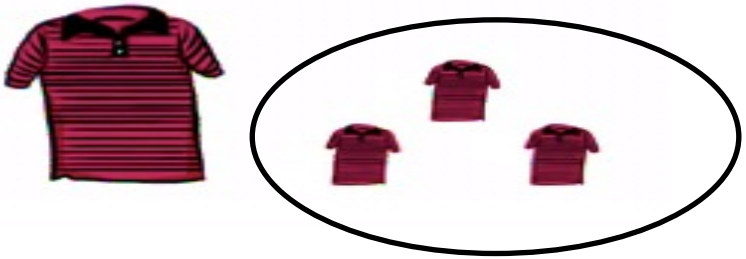
When a notional mass noun such as *y'a* 'water' is combined with a count quantifier - *itxïbi* 'many' – it will be interpreted as quantifying over the number of concrete portions of x.

Prediction 3: *size adjectives*

A size adjective - *urahu* 'big' - will introduce the property of being big to a concrete portion of x (for nouns like y'a 'water').

Quantity judgments: Who has many x?

Ma de **itxïbï** xãã dju a'u?
who many bowl have



Ma de **itxïbï** abeata dju a'u?
who many clothes have

Ma de **itxïbï** asa dju a'u?
who many flour have

Prediction: 'Number' answer for all nouns (notional count, aggregates, notional mass)

Quantity judgments: Who has a big x?

Ma de	**urahu**	xãã	dju a'u?
who	big	bowl	have

Ma de	**urahu**	abeata	dju a'u?
who	big	clothes	have

Ma de	**urahu**	asa	dju a'u?
who	big	flour	have

Prediction: 'Volume' answer for all nouns (notional count, aggregates, notional mass)

Quantity judgments and count-quantifiers: predictions 2 and 3

	Count-quantifier *itxïbi* 'many'	Volume adjective *urahu* 'big'
Notional count nouns / Aggregates (control)		
Notional mass nouns (critical)		

Quantity judgments: results

Children and adults associated *itxïbï* 'many' to 'Number' and urahu 'big' to 'Volume' for all nouns:

*Who has **itxïbï** x?* – Percentage of 'Number' responses

'Noun category'	Adults	Children (2 – 5)	Children (6 - 11)
Notional mass noun	100%	89 %	91 %
Notional count noun	100%	92 %	100 %
Aggregate noun	100%	85 %	93 %

*Who has **urahu** x?* – Percentage of 'Number' responses

'Noun category'	Adults	Children (2 – 5)	Children (6 - 11)
Notional mass noun	0 %	28 %	33 %
Notional count noun	0 %	25 %	16 %
Aggregate noun	0 %	14 %	33 %

Predictions 2 and 3

Predictions 2 and 3 were confirmed:

Itxïbï 'many'

- Speakers answer 'Number' for the question 'Who has **itxïbi** x?' for all nouns (many individuals or many concrete portions of a substance [e.g., piles of flour])

Urahu 'big'

- Speakers answer 'Volume' for the question 'Who has **urahu** x?' for all nouns (big individuals or big concrete portions of a substance [e.g., big pile of flour])

Summary: Pattern 1 and 2 vs. Pattern 3

Pattern 1 and Pattern 2 languages (count and mass nouns are grammatically distinct):

- mass nouns are significantly less likely to be associated with the 'Number' response.

  Languages:

  English (Barner and Snedeker 2005)
  Mandarin Chinese (Li et al. 2008)
  Brazilian Portuguese (control group)

Pattern 3 (all nouns are count):

- All nouns are associated with the 'Number' response.

  Languages:

  Yudja

Summary: Pattern 1 and 2 vs. Pattern 3

- **Yudja:** different variations of concrete portions can be an atom for a (notional) mass noun.
  - Example: different types of concrete portions of water (bowls, drops, puddles) can be atoms and be counted.
- **English, Chinese, Dene Suliné, Brazilian Portuguese:** there are also a variety of concrete portions of a kind that may be considered for counting, but container/ measure or classifiers restrict them.

Final remarks

- In Yudja, concrete portions of a kind can count as an atom.

- The absence of the requirement for classifiers or container/measure phrases in Yudja (*and the use of locative phrases instead* – property 2) is correlated with the fact that all nouns can be treated as count in languages like Yudja, but not in languages like English.

Thank you!

- Yudja communities

- Tawaiku Juruna and Chadaha Juruna (research assistants in the field)

- Seth Cable, Gennaro Chierchia, Brian Dillon, Lyn Frazier, Angelika Kratzer, Jesse Snedeker, Guillaume Thomas.

- Capes/Fulbright and NSF Dissertation Improvement Grant (BCS – 1226449)