Numerals and the universal packager in Yudja (Tupi)$^1$

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Abstract
This paper documents the distribution of numerals in Yudja (Juruna family, Tupi stock, spoken in Brazil). Yudja is characterized by its bare arguments, optional and [+ human] restricted plural morphology and the absence of numeral classifiers. The central aspect we discuss in this paper is the ability of nouns to be combined directly with numerals in this language. Based on Rothstein (2010), and Chierchia (2010), who argue that a contextually dependent atomic function is needed for counting, I will argue that in Yudja nouns can have count or mass semantics depending on a contextual parameter that is part of the process of defining atoms available for counting.

1. Introduction

Linguists and philosophers have extensively discussed how languages encode the count and mass distinction. It has been proposed that both syntactic and semantic criteria can be used as evidence for this distinction. From a semantic perspective, it is commonly assumed that “count nouns, but not mass, designate a set of entities; Mass nouns, but not count nouns, designate stuff” (Pelletier 2010)$^2$. From a descriptive perspective$^3$, pluralization of nouns, distribution of determiners and numerals are some of the syntactic conditions that have been used to distinguish count and mass nouns.

In the so-called number-marking languages, nouns that denote ‘entities’ pluralize while nouns that denote ‘stuff’ do not:

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1 Yudja is spoken by 294 people in the Xingu Indigenous Territory, Brazil. All data presented in this paper are result of my two most recent fieldworks realized in 2009 and 2010 in Yudja communities. I am thankful to Karin and Tawaiku Juruna, my two principal consultants who works with me since 2005. I am also very thankful to Angelika Kratzer, Lyn Frazier and Seth Cable. All mistakes are mine.

2 Pelletier (2010) presents this idea as background for his discussion, but this is not his working hypothesis. In fact, he argues against it.

3 Chierchia extensively describes these criteria. For more details, see Chierchia (1998a), (1998b) and (2010).
1a This dog/girl is happy
1b These dogs/girls are happy

2a That blood is RH Positive
2b ?? Those bloods are RH Positive (Chierchia 2010; 109 – examples (19a) and (19b))

3a That gold weighs two ounces
3b ?? Those golds weigh two ounces (Chierchia 2010; 109 - examples (19c) and (19d))

In the examples above, dog and girl, but not blood and gold can be pluralized because the former but not the later have clearly individuated entities in their extensions. Another piece of evidence for the count/mass distinction is the distribution of determiners. In English, for instance, the determiner system is sensitive to the mass/count distinction:

4. the/some boy 4'. the/some boys 4''. the/some water
5. a/every boy 5'. * a/every boys 5''. * a/every water
6. *most/all boy 6'. most/ all boys 6''. most/ all water

(Chierchia 2010 - examples (21a), (21b) and (21c))

The determiners the and some can combine with any noun, either count (4 and 4') or mass (4''). Determiners such as a and every are restricted to singular count nouns (5). Finally, determiners such as most and all are restricted to plural and mass nouns (6' and 6'', respectively).

Not only English, but other languages, such as the Romance languages, use these two morphosyntactic criteria - pluralization of count nouns and distribution of quantifiers – to distinguish between the two classes of nouns.

The second type of language described in the literature on the semantics of nouns uses classifier systems. Classifier languages are characterized by (i) generalized bare arguments, that is, nouns which are not associated with any functional material, occurring without articles, number inflection, case, etc.; (ii) the absence of pluralization and (iii) the requirement of a classifier. A classifier is understood here as “a word that denotes something like a
measure, a container, or shape based words that express something like ‘unit’” (Chierchia 2010; 107):

Mandarin Chinese

7a \begin{tabular}{ll}
\textit{san} & *(ge) \textit{n}anbai \\
three & boy
\end{tabular}

7b \begin{tabular}{ll}
\textit{yi} & *(\text{ben}) \textit{sh}u \\
one & book
\end{tabular}

‘three boys’

‘one book’

(Chierchia 2010; 107 – examples 15a and 15b)

Examples 7a and 7b show that nouns in Chinese require a classifier, including nouns that have well-individuated atoms in their extensions, such as \textit{n}anbai ‘boy’ and \textit{sh}u ‘book’. Note, however, that the distribution of classifiers is not unrestricted in this language. Cheng and Sybesma (1999) argue in favor of count-classifiers and mass-classifiers (henceforth massifiers) in Chinese. For instance, the classifier \textit{ge} does not combine with mass nouns or, if it does, it forces a count interpretation:

Mandarin Chinese

8b \begin{tabular}{ll}
\textit{san} & \textit{ge} \textit{xue} \\
three & blood
\end{tabular}

‘three portions of blood’

(Chierchia 2010; 107 – examples 14)

Cheng and Sybesma (1999) show that some modifiers and adjectives can occur with one class of classifiers but not with the other. For instance, a modifier marker \textit{de} can intervene between [massifier+N], but not between [count-classifier+N]:

Mandarin Chinese

9a \begin{tabular}{ll}
\textit{san} & \textit{bang} \textit{(de)} \textit{rou} \\
three & pound \ DE meat
\end{tabular}

‘Three pounds of meat’

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4 There is some controversy as to whether some classifiers are associated only to count nouns and others only to mass nouns in Chinese. See Li (2010).
Another aspect of the distribution of classifiers in Chinese is the fact that some adjectives modify massifiers but not count-classifiers:

**Mandarin Chinese**

10a. *yi da zhang zhi*

one big CL.sheet paper

'One large sheet of paper'

(Cheng and Sybesma 1999; 516 – examples 14a and 15a)

This set of examples show that even though pluralization and distribution of determiners are not criteria for the distinction between count and mass nouns in Chinese, other criteria can be used to establish this distinction.

The third type of language described in the literature, the number-neutral languages, share some properties with classifier languages. To start with, these languages, like classifier languages, are characterized by generalized bare arguments:

**Dëne Suliné**

11a. *k’āšba nāghilnigh*

chicken PERF-1SG-buy O

‘I bought a chicken’

(Willhelm 2008; 45 - examples 4a (11a) and 4c (11b))

In these examples, the nouns are bare in argument position (subject or object), i.e., *k’āšba* ‘chicken’ (in 11a) *lî* ‘dog’ and *dēneyuazë* ‘boy’ do not have articles (for definiteness) nor case or number inflection. The second characteristic that number-neutral languages share
with classifier languages is the absence of plural morphology:

Dëne Suliné

12a  Larry  láğhe  ejère  nághélígh

Larry  one  bovine  PERF-buy O

“Larry bought one cow’

12b  Larry  ejère  nádághélígh

Larry  bovine  DIST-PERF-buy O

‘Larry bought several cows / cattle’

(Wilhelm 2008; 45 - examples 5a and 5b)

In the cases above, ejère has the same morphological form for singular (‘cow’ (12a)) and plural (‘cows’ (12b)), where, crucially, no morphology is added. What distinguishes count and mass nouns in these languages is the fact that nouns that denote ‘entities’ can directly combine with numerals while nouns that denote ‘stuff’ cannot. That is the first property that distinguishes classifier languages from number-neutral languages. Differently from classifier languages, number-neutral languages do not require a classifier system. But, as in number-marking languages, measure phrases are required to mediate the relation between numerals and mass nouns in Dëne Suliné (13c):

Dëne Suliné

13a  solághe  dzol

five  ball

‘five balls’

(Wilhelm 2008; 46 - example (8c))

13b  * solághe  ber  13c  solághe  nedádhi  bër

five  meat  five  pound  meat

‘Five pounds of meat’

(Wilhelm 2008; 47 - example (9b))  (Wilhelm 2008; 47 - example (10a))

The impossibility of combining directly mass nouns with numerals is thus not only
an important characteristic for number-neutral languages but also for number-marking and classifier languages:

English (Number-marking language)

14  *Thirty three bloods/ waters/ golds  

(Chierchia 2010; 104 – example 2b)

Mandarin (Classifier language)

15a  *san rou  

15b  san bang rou  

three meat  

three CL meat  

‘three pounds of meat’  

(Chierchia 2010; 104 – example 5)

So far, no language has been described where mass (‘stuff’) nouns can directly combine with numerals. Some authors (e.g, Chierchia 2010) consider this gap one of the strongest criteria for the count-mass distinction.

As an illustration of the restriction preventing mass nouns from directly combining with numerals, consider the mass nouns beer and blood. To combine these nouns with numerals, a phrase providing a unit (bottles, cups, tubes for instance) or coercion is required. Coercion (universal packager) is only possible if a standard serving of the relevant substance is involved. For instance, in a restaurant one can say “three beers, please” because a standard serving of beer (bottles, glasses) is implied. However, there is no such thing as a standard measure unit for blood. One could say that test tubes can be a standard measure unit for blood. Nevertheless, without very special contexts it sounds unnatural to say “Three bloods are over there”. In other words, except in an environment where blood tubes are standard, such as a laboratory, coercion does not occur.

The impossibility for typical mass nouns to directly combine with numerals is assumed to be a stable universal in the literature and has recently been labeled as ‘the signature property’ by Chierchia (2010). As a consequence, if there is a language where all nouns can be directly combined with numerals, a natural question is if a distinction between mass and count nouns is made at all in that language and if so, how.

This paper discusses Yudja, which is a language where ‘stuff’ nouns can be directly combined with numerals without measure phrases. I will show that coercion is not involved
in the domain of numerals. Instead, a count or mass use of a noun is strongly context dependent. Section 2 introduces coercion and its relation with the count-mass distinction. Section 3 introduces the basic properties of Yudja concerning bare arguments and pluralization. Section 4 presents a questionnaire testing the possibility of combining numerals directly with nouns that denote substances. Section 5 presents the theoretical implications of the distribution of nouns in Yudja based on Rothstein’s (2010) and Chierchia’s (2010) contextual parameter analysis. Finally, section 6 presents a description of the quantifiers in this language.

2 Coercion and the count-mass distinction

Coercion or ‘recategorization’, in Corbett’s (2000) terms, is a technical term for the shifts from count to mass nouns and mass nouns to count nouns. To exemplify these shifts, consider the count noun chicken. The standard interpretation of chicken is a count interpretation, the animal itself as in 16:

16 “There are four chickens over there”.

The fact that some nouns, such as chicken, are considered ‘naturally’ able to be count does not exclude their possibility of presenting a mass interpretation:

17 There is chicken in the soup

   Enriched interpretation: ‘There is chicken meat in the soup’
   (Wiese and Maling 2005; 3 – example (2c))

In (17), one can easily understand that chicken refers to ‘meat’, as the substance, not
as the ‘animal’ as in (16). Conversely, if some nouns are considered mass, that does not exclude the possibility that they may be used as count nouns:

18 The best wines are from Chile
   Enriched interpretation: ‘sorts of wine’
   (Wiese and Maling 2005; 5 – example (3a))

19 Two beers and a coffee, please
   Enriched interpretation: ‘portions of beer, portions of coffee’
   (Wiese and Maling 2005; 5 – example (3b))

In (18) the substance ‘wine’ can have an enriched interpretation that yields sorts of substances. In (19) the interpretation of substances such as ‘beer’ and ‘coffee’ yields portions. Examples (17)-(19) represent the three different processes described in the literature under the name of “coercion”. In (17), the process of shifting involved is the ‘universal grinder’ (Pelletier 1975). The universal grinder transforms objects into substances. In (18), the mapping involved is the ‘universal sorter’ (Bunt 1985), which derives sorts from substances. Finally, in (19), the shift is the so-called ‘universal packer’ (Jackendoff 1991). This function takes a substance and returns portions associated to it. Wiese and Maling (2005) visualize these three operations in the following figure:
Figure 1 Wiese and Maling (2005; 6) - ‘Conceptual enrichment in mass/count coercion’

A central question is how free are these shifts: are they unrestricted or are there criteria to determine if a shift is possible or not?

Doetjes (1997; 22) argues that count-mass shifts have a regular pattern and that mass-count shifts are unpredictable. Consider the universal grinder as a kind of count to mass noun shift. This shift is possible in appropriate contexts for all nouns that describe physical objects. Gleason (1965) (apud Pelletier 1979 6-7) introduced the idea that coercion is context-dependent:

“Are there limitations to this shifting [between count and mass senses]? (...) it is soon found that many of the ones with both uses are very much more frequent in one than in the other. The less frequent use occurs only rather unusual circumstances. Water as a mass noun is common and widespread; as a count noun is nearly restricted to waiters. Perhaps some of the other words would also show both uses if sufficiently unusual situations were conceived. This seems to be the case. For example, book and shelf are both fairly typical count nouns. With the present vogue for speaking – animal stories, we can imagine one featuring a mother termite concerned over the child Jonny is very choosey about his food. He will eat book, but he won’t touch shelf. This is far-fetched, of course. But it does suggest that every noun, given the right context, can occur in either type of usage, count or mass”
Gleason (1965) (apud Pelletier 1979 6-7)

The example cited by Gleason involves the use of the count nouns book and shelf as mass nouns. Both book and shelf are count nouns that denote physical objects therefore, can undergo this shift. Abstract nouns such as characteristic, mile or aspect (Doetjes 1997; 22), on the other hand, cannot undergo this shift.

The shift of mass nouns into count nouns or into names for kinds requires a different explanation. As described by Doetjes (1997), some cases of kind interpretations for mass nouns do not imply coercion. Consider (20), (21) and (22):

Dutch
20 Ze verkopen dit hout al jaren
They sell this wood since years
‘They have been selling this (type of) wood for years’
(Doetjes 1997; 22 – example (10))

Portuguese

21   *Eles vendem essa madeira há anos
They sell this wood there is years
‘They have been selling this wood for years’

Portuguese

22   *Eles vendem esse ouro há anos
They sell this gold there is years
‘They have been selling this (type of) gold for years’

In (20), (21) and (22) above, we cannot consider wood (hout in Dutch or madeira in Portuguese) as a count use of a mass noun because it cannot be pluralized, as shown below.

Recall that pluralization is a central property of count nouns in number-marking languages:

Dutch

23   *Ze verkopen verschillende duurzame *houten/houtsoorten
They sell different durable woods/kinds of woods
‘They sell different kinds of durable wood’
(Doetjes 1997; 23 – example (11))

Portuguese

24   *Eles vendem diferentes ? madeiras/ tipos de madeiras duráveis
They sell different ? woods/ kinds of woods
‘They sell different kinds of durable wood’

In Portuguese, an example of a mass noun that cannot be pluralized is ouro ‘gold’, which means that it cannot undergo coercion:

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5 The examples in this paper are followed by the identification of their original source. The cases where the author is not identified are examples created and/or elicited by me.

6 There is an extensive literature on the count-mass distinction in Brazilian Portuguese. Consult Paraguassu-Martins and Müller (2007).
Tem *ouro-s de boa qualidade na loja do Pedro

There are gold-PL of good quality in the.FEM store of Pedro

‘There are golds of good quality in Pedro’s store’

The examples above show wood cannot undergo coercion because it cannot be pluralized. Unlike wood/hout/madeira, the noun wine/ vinho/ wijn can undergo coercion in (27) and (28), as shown by the fact that it can be pluralized:

Portuguese

26 Vinho uruguaio é ótimo, mas o vinho chileno é melhor

Wine Uruguayan is great, but the wine Chilean is better

“Uruguayan wine is great, but Chilean wine is better”

Portuguese

27 Vinhos uruguaios são ótimos, mas os vinhos chilenos são (os) melhores

Wine-PL Uruguaian.PL are great-PL, but the.PL wines Chilean-PL are (the) best-PL

‘Uruguaian wines are great, but Chilean wines are (the) best’

Portuguese

28 Maria experimentou diferentes vinhos

Maria tasted different wine.PL

“Maria tasted different wines”

Unlike madeira (wood), vinho (wine) must have undergone coercion in (27) and (28), because the noun is pluralized. The same can be observed in Dutch (29):

Dutch

29 Marie heeft verschillende wijnen getrufen

Marie has different wines tasted

“Marie tasted different wines”
These examples show that in Dutch, Brazilian Portuguese and English shifts from mass nouns to kinds are restricted to some nouns and are context/culture dependent. These shifts are strongly associated with standard uses of a given noun.

Like the availability of the universal sorter, the availability of the universal packager is culture dependent and restricted to standard uses, in this case to standard serving units or conventional containers. For instance, we can say in a restaurant “three beers, please” because this is related to a standard serving of beer. The literature (cf. Gleason (1965) *apud* Pelletier (1975) Frisson and Frazier (2005), Wiese and Maling (2005)) says that these shifts are more commonly accomplished in the domain of food and drink. As presented in Gleason’s (1965) quotation, containers associated with ‘restaurant talk’ are easily conventionalized in a large number of languages and cultures, possibly because of frequency of use. However, containers associated with *saliva, blood and sand* are not conventionalized. To illustrate, consider the following examples:

Context: a police inspector enters a house where a murder has been committed and discovers three very clearly individuated puddles of blood on the floor (Angelika Kratzer p.c.)

30 * There are three bloods on the floor.

Context: after a blood transfusion, a nurse had to store four tests tubes with blood RH O-in the fridge.

31 * Four RH negative bloods are stored in the fridge.

Context: Pedro has a boxer dog that has a big mouth. His dog left the house to get the newspaper and on his way out three clearly individuated drops of saliva fell on the ground.

32 * There are three salivas on the floor.
Context: the children decided to play on the beach. At the end of the day they brought three containers full with sand.

33 * The children brought three sands

   In these examples, clearly individuated portions are salient in the context. However, these nouns do not have a ‘conventional container’ associated with them. Therefore, a measure unit associated with these nouns is needed:

34 * There are three bloods on the floor / There are three puddles of blood on the floor

35 * There are three salivas on the floor / There are three drops of saliva on the floor

36 * The children brought three sands / The children brought three containers with sand

   In the case of the noun beer, on the other hand, if conventional containers are available, they can be used without a measure phrase:

37 Maria drank three beers last night and today she has a hangover

   The examples presented in this section were used to show that a transition between count and mass nouns and vice-versa is restricted by different requirements. For the universal grinder (a shift from count to mass nouns), Doetjes (1997) hypothesized that only physical objects can ‘pass through the grinder’, in the right contexts. Shifts from mass to count nouns, such as the universal packager (a shift from masses to portions) and the universal sorter (a shift from masses to kinds) are context/culture dependent. In the case of the universal packager, the clear individuation of the substance’s portions and a conventionalized container are required, but these are not sufficient requirements. We can find gaps in the regularization of what is called universal packager when we compare examples such as wine and beer. As we observed in 37, the noun beer can be combined directly with numerals and refer to portions of beer. That is different for the noun wine. Wine without
a measure phrase would have a universal sorter reading. For instance, if one say ‘Pedro bought four wines for his party, which will start at midnight’ ‘four wines’ will refer to four different kinds of wine, not four different bottles. If coercion were a consistent grammatical process we would have the same results for wine and beer as both nouns have standard serving units associated to them.

The existence of coercion is a serious empirical challenge for the claim that, in Yudja, typical mass nouns can directly combine with numerals without an intervening measure phrase. When testing the acceptability of such combinations, the field worker has to create scenarios that rule out coercion as a possible explanation for positive judgments. Before proceeding to a detailed discussion of the questionnaire that was used to elicit relevant judgments for Yudja, I will present the basic nominal properties of the language.

3 Basic nominal properties of Yudja

3.1. Bare arguments

Yudja is a bare noun language, i.e., nouns are unspecified for number (singular, plural) and unspecified for definiteness (definite or indefinite):

38 ali ba’i ixu
child pacä eat
“The/a/child(ren) eat(s)/ate the/a pacä(s)”
Literal: an undefined number of children eat(s)/ate an undefined number of pacä(s).

Bare nouns are not only used in episodic sentences, but they can also be used in ‘kind’ and ‘generic’ sentences:

39a kaniä urabu yabä Xingu be api’i mama
animal big/bigger REL Xingu in dog big
‘The biggest animal of Xingu is the jaguar’

39b takum idubu ann
Mutums are in extinction’

‘Insects like blood’

3.2. Plurals

Yudja has an optional plural morpheme -i restricted to [+ human] nouns (Fargetti 2001). If a [+ human] noun refers to pluralities, the preference is to use the noun modified by -i (see 40b and 40c). However, a non-pluralized [+ human] noun can also refer to pluralities as we can see in (40a) below:

40a Senabi kota ixu
  man snake eat
  ‘A/the man/men eat(s)/ate a/the snake(s)’
  Literal: an undefined number of men eat(s)/ate an unspecified number of snakes

40b Senabi-i kota ixu
  man-PL snake eat
  ‘(The) men eat/ate a/the snake(s)’
  Literal: a plural set of men eat/ate an unspecified number of snakes

40c kota senabi-i ixu
  snake man-PL eat
  ‘(The) snake(s) eat(s)/ate a/the man/men’
  Literal: an unspecified number of snakes eat(s)/ate an unspecified number of men

40d * Kota-i senabi ixu
  snake-PL man eat

Examples that include bare arguments can also be related to indefinite interpretations of bare nouns.
Example (40a) is ambiguous between an interpretation where a single man or more than one man ate a/the snake(s). In (40b) and (40c), the plural morpheme {-i} excludes the possibility of the interpretation ‘one single man’. (40d) and (40e) are ungrammatical because this morpheme is never associated with [ - human] nouns. The facts presented show that plural is not associated with nouns that denote entities (usually count nouns) or with nouns that denote masses (usually mass nouns). This shows that plural does not distinguish count from mass nouns in Yudja.

Another important criterion to distinguish count from mass nouns cross-linguistically is the direct combination of numerals with nouns. In Yudja there are no numeral classifiers associated with numerals. This characteristic differentiates Yudja from classifier languages, which are also characterized by the absence of plural morphology and bare arguments. The question is whether Yudja is similar to other number-neutral languages such as Dene Sulîne where measure phrases are required for the combination of typical mass nouns with numerals.

4 A questionnaire on coercion: numerals and the universal packager

An important question discussed in section 2 was the universal packager, which is one of the types of coercion. The universal packager is the shift from mass nouns to portions in constructions with numerals. Cross-linguistically, mass nouns can only be combined with numerals if a measure phrase is involved otherwise the sentence is ungrammatical or the universal packager may be used. As we saw, the universal packager is not an unrestricted operation. For coercion to be available, clearly individuated portions and a standard container should be associated to the noun.

The discussion on the universal packager will be central in the discussion of numerals and nouns in Yudja. In this language, most nouns can be combined with numerals without measure phrases no matter whether these nouns denote entities or substances. For instance, all the following nouns can be directly combined with numerals without classifiers
or measure phrases. Consider the number txabïu ‘three’ in the following examples:

Entities (usually denoted by count nouns cross-linguistically): txabïu ali/alii ‘three child/children’, txabïu senahï /senahïi ‘three man/men’, txabïu ba’ï ‘three paca(s)’, txabïu amï ‘three monkey(s)’.


Two different hypotheses can be proposed to explain the fact that nouns that denote entities (such as ‘dog’, ‘paca’, ‘child’, ‘woman’, ‘man’, ‘monkey’, and others) and nouns that denote masses (such as ‘sand’, ‘salt’, ‘blood’, ‘rain’, ‘rice’, and others) can equally be combined with numerals in this language. The first hypothesis one can raise is that the apparently free elasticity of nouns is related to coercion and, if that is the case, the signature property is not violated. The second hypothesis is that coercion is not involved, i.e., conventionalized containers of the noun are not required for the use of typical mass noun as count nouns. In the next section I present a questionnaire to test these two hypotheses.\(^8\)

**Items and methodology**

The questionnaire was composed of 20 nouns (*milk, meat, fish, sand, salt, sugar, fat/grease, water, blood, cotton, wood, oil, nasal secretion, saliva, yakuba [traditional alcoholic drink] rain, rice, flour, honey, beans*). The questions consisted of using the nouns listed above in two different types of context. In the first type of context (henceforth ‘conventional context’), the consultants were exposed to a context (by using minimal narration and a picture that

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\(^8\) One could also raise a third hypothesis: numerals quantify events and not entities in Yudja. That hypothesis does not hold because numeral quantification of events requires the adverbializer morpheme {ha} and numeral quantification of entities does not require any special morphology (and results in ungrammaticality if a numeral modified by {ha} quantifies nouns). In that sense, there is no ambiguity in the numeral quantification domain.
described the context) where clear individualized portions of a noun and a standard container were provided:

*Apeta* 'blood'

Tamariku, enfermeiro em Tuba Tuba, trouxe 3 potes de sangue do Diauarum.
*Tamariku, a nurse in Tuba Tuba, brought three containers of blood from Diauarum.*

**Target question, option 1 (In Brazilian Portuguese):**

Como eu digo “Tamariku trouxe três potes com sangue? Posso dizer “Tamariku trouxe 3 sangues?”

*How do I say “Tamariku brought three containers with blood? Can I say “Tamariku brought three blood(s)?”*

**Target question, option 2 (In Yudja):**

É correto dizer Tamariku txabïu apeta dju wi?

*Is it correct to say “Tamariku brought three blood(s)?”*

In the second type of context (henceforth ‘unconventional context’), the consultants were exposed to a different context (again, making use of minimal narration and a picture that described the context) where clear individuated portions were still available, but standard containers were not. Instead, in the second context presented, unconventional uses of the noun were presented:

*Apeta* 'blood'

João cortou seu dedo e três gotas caíram no chão. Uma perto da escola, outra perto do rio e uma perto de sua casa.

*João cut his finger and three drops of blood fell on the ground: one near the school, another near the river and another near his house.*

**Target question, option 1 (In Brazilian Portuguese):**
Como eu digo “Três gotas de sangue caíram no chão?” – Posso dizer “Três sangue(s) caíram no chão?”

*How do I say, “Three drops of blood fell in the ground”? Can I say, “Three blood(s) fell on the ground?”*

**Target question, option 2 (In Yudja):**

É correto dizer txabiú apeta lapa?

*Is it correct to say “three blood(s) fell”?*

Two Yudja native speakers were consulted. In some moments, other Yudja speakers stayed in the room and supported the decisions of the consultants. The brief narration of the contexts was in Brazilian Portuguese. In most cases, the target sentence was asked in Yudja to avoid bias. In case the answer of the consultant included a measure phrase, it was asked if the sentence would still be possible without the measure phrase.

The goal of the questionnaire refers back to the hypothesis presented in section 2. In languages where coercion (universal packager) is required when a mass noun is combined with a numeral without classifiers or measure phrases, coercion is not an operation available for all nouns. Instead, coercion depends on clear individuated portions of the noun and on culturally standardized containers. In a language such as Yudja where ‘stuff’ nouns are combined with numerals without measure phrases or classifiers, the question is if coercion is involved in these processes and if it is, in what extent. To answer this question, the task is to observe if numerals can be combined with mass nouns when they are used with unconventionalized containers. In English, we observe the following:

Conventional context: the nurses from Diauarum brought 3 containers with blood to the Tuba Tuba village. How do I say “the nurses brought three containers with blood”? Can I say, “the nurses brought three bloods?”

41a ‘The nurse brought three tubes with blood’
41b *‘The nurse brought three blood(s)’

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9 I will refer to ‘stuff’ nouns instead of mass noun to avoid assuming that nouns in Yudja are lexically count or mass. In other words, I am not assuming that an ontological distinction between ‘stuff’ and non-stuff nouns is necessarily transparent to the language. Instead, it may be the case that all nouns can have count and mass uses. That is going to be discussed later in this paper.
Unconventional context: João cut his finger and 3 drops of blood fell on the floor: one near the school, another near the river and another near his house. Could I say “Three drops of bloods fell on the floor”? Can I say, “Three blood fell on the floor?”

42a  ‘Three drops of blood fell on the floor’
42b  * ‘Three bloods fell on the floor’

The examples above show that in English some mass nouns when combined with conventional or unconventional containers, cannot be combined directly with a numeral without measure phrases (see 41b and 42b). Blood is an extreme example in English because even with a possible conventionalized container (such as ‘test tube’) implicated in the context the noun requires a measure phrase (41b). In many languages, including English, it is hard to say that a standard unit of measure is associated with blood except in highly specialized contexts, such as ‘hospital talk’, which is evidence that standardization of containers in a language is both contextual and cultural dependent. There are cases however where coercion is possible if a conventional container is provided in the context, but under no circumstance coercion is possible if a conventional container is not provided. That is the case for the noun wine in English. Consider the contexts below:

Conventional context: A waitress brought to Pedro’s table three bottles of wine. To describe this context, we can say:

43a  There are three bottles of wine on the table
43b  There are three wines on the table

Unconventional context: a distracted waitress was carrying a very full glass of wine to Pedro’s table. The restaurant was very crowded and she bumped three times into people standing when she was walking. The owner was looking at her and he noticed that three clear individuated drops of wine fell on the floor in different locations. In this context, we can say…
44a There are three drops of wine on the floor
44b * There are three wines on the floor

Differently from what was observed for blood, in the examples involving wine, coercion was possible if a conventional container was available (43b). However, just like blood, coercion is not possible if a conventional container was not involved in the context (44b). The following table summarizes these two patterns:

<table>
<thead>
<tr>
<th></th>
<th>Pattern 1: Nouns like Blood</th>
<th>Pattern 2: Nouns like Wine</th>
<th>Unattested pattern 1</th>
<th>Unattested pattern 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Can nouns be combined with numerals without measure phrases in conventional contexts?</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Can nouns be combined with numerals without measure phrases in unconventional contexts?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

45 English (number-marking language)

Note that there are two logical possibilities that are not attested in English. These two logical possibilities are not attested because they imply that coercion would be available in unconventional contexts and that violates one of the requirements for the universal packager to occur. That reinforces the discussion in section 2. That is, as proposed by Doetjes (1997) the universal packager (from mass nouns to portions) type of coercion is much more restricted than other types of coercion such as universal sorter (from mass nouns to kinds) or universal grinder (from count nouns to mass nouns).

Now we will see what happens in Yudja, a number-neutral language where the ‘signature property’ does not seem as strong as it is cross-linguistically. The hypotheses being tested are whether coercion plays a role in the generalized possibility of combining ‘stuff’ nouns with numerals or not. In case coercion does play a role in Yudja, speakers would
consistently refuse scenarios where a ‘stuff’ noun is combined with a numeral and a conventional container is not involved, as observed in English. However, if coercion is not involved and the possibility of combining ‘stuff’ nouns with numerals is not dependent on measure phrases or classifier-like phrases, then nouns will be combined with numerals even when conventional containers are not available which is not a possibility for most languages cross-linguistically. We will see the results below.

Results

The results for the questionnaire are presented in two groups: one that does not require any measure phrase or classifier-like phrase (eta ‘sand’, yukidi ‘salt’, açucar ‘sugar’, ikaha ‘fat/grease’, y’a ‘water’, apeta ‘blood’, makua ‘cotton’, nã ‘oil’, yakuba ‘traditional drink’, amana ‘rain’, awatsi’i ‘rice’, asa ‘flour’, awila ‘honey’ and puju ‘beans’) and another where the nouns included the morphem atxa, not only in counting, but also in non-counting contexts (pitxa ‘fish’, abhanama atxa ‘milk’, kania atxa ‘meat’, epa ‘wood’, i’aksu itxa ‘nasal secretion’, ikuritsa ‘saliva’). Even though this last category also allows nouns to combine direct with numerals, we present in a special subsection because of some relevant considerations about the morpheme atxa.

**Group 1: Typical mass nouns that can be combined directly with numerals**


*Apeta ‘blood’*

Conventional context: a nurse from Diauarum brought 3 containers with blood to the Tuba Tuba village:
46a  Txabïu  uda  apeta  djw wï
    three  someone  blood  bring

    ‘Someone brought three (containers with) blood’

Unconventional context: João cut his finger and 3 drops of blood fell on the floor: one near the river, one near the house and another near the school:

46b  Txabïu  apeta  pe~pe~pe
    three  blood  drip~RED

    Literal: ‘Three (drops of) blood dripped (in different events)\(^{10}\)

    Differently from what we have observed for English (examples 43 and 44), in Yudja apeta ‘blood’ can be combined with numerals without measure phrases or classifiers\(^{11}\). Apeta ‘blood’ can be combined with a numeral if a possible conventional container (46a) or unconventional units of measurement are implied (46b). As a consequence, that is not a case of coercion. The next set of examples involves liquid ‘stuff’. All the examples below corroborated that coercion is not responsible for the combination between mass nouns and numerals because even when non-conventional containers/uses of the noun are inserted in the context, the ‘stuff’ noun can be combined with the numeral without measure phrases. See the examples:

    Y’a ‘water’

Conventional context: a woman brought three containers of water to the school:

47a  Txabïu  idja  y’a  djw wï
    three  woman  water  bring

---

\(^{10}\) We emphasize ‘different events’ not because of the numerals, but because of the reduplicated verb.

\(^{11}\) The reader may note here that the numeral does not form a constituent with the noun it is combined with. One could say that in these cases the numeral is quantifying the event, not the noun. However, as discussed in the footnote 8, that is not the case because when numerals quantify the event, an adverbializer morpheme attached to the numerals is required such as txabïha ‘three times’ (where {-ha} is an adverbializer).
Literal: ‘A woman brought three (containers with) water’

Conventional context 2: a woman brought three containers with water. The containers fell at the same moment and made a single big puddle on the floor:

47b \text{Txabiu} \quad \text{y’a} \quad \text{ipide} \quad \text{l-apa}
\begin{align*}
\text{three} & \quad \text{water} & \quad \text{on the floor} & \quad \text{1-fall}
\end{align*}

Literal: ‘Three (containers with) waters fell on the floor’

In examples (47a) and (47b), standard servings of \text{y’a} ‘water’ (in the original example, a bowl, which is a standard container in this culture) were presented in the context. The example (47c) is a case of unconventional containers associated to \text{y’a} ‘water’:

Unconventional context: someone brought a container of water and let a drop fall near the school, another drop near the hospital and a last drop near the river (all drops are different in size and form):

47c \text{txabiu} \quad \text{y’a} \quad \text{ipide} \quad \text{pe} \sim \text{pe} \sim \text{pe}
\begin{align*}
\text{three} & \quad \text{water} & \quad \text{on the floor} & \quad \text{drip} \sim \text{RED}
\end{align*}

Literal: ‘Three (drops of) water dripped on the floor (in different events)’

In this case, the units of measurement in the scenario were clearly individuated drops of irregular sizes and forms. These drops are non-standard uses of \text{y’a} ‘water’ and as a consequence, coercion is not involved. Next, consider the examples that refer to the noun \text{n’ã} ‘oil’:

\text{U’ã} ‘oil’

Conventional context: someone brought two containers full of oil:

48a \text{Yanda} \quad \text{n’ã} \quad \text{djw wî}
\begin{align*}
two & \quad \text{oil} & \quad \text{bring}
\end{align*}

‘(Someone) brought two (containers with) oil’
Conventional context 2: someone dropped two containers with oil and one puddle was formed on the floor:

48b  \textit{Yanda n'â l-apa}  
Two oil 1-fall  
‘Two (containers with) oil fell (on the floor)’

Unconventional context: someone was walking with a bowl full of oil and in the way, two clearly individuated drops of oil fell, one near the school’s kitchen and another near the fire:

48c  \textit{yanda n'â pe~pe~pe}  
two oil dripped.RED  
‘Two (drops of) dripped (on the floor) (in different events)’

As expected, these constructions may include a measure phrase (49a for \textit{yakuba} ‘traditional drink’, 50a for \textit{awîla} ‘honey’), but that is not a requirement (for \textit{yakuba} ‘traditional drink’ see examples 49b, 49c for conventional contexts and example 49d for unconventional contexts and for \textit{awîla} ‘honey’ see 50b for a conventional context and 50c for an unconventional context):

\textbf{Yakuba} ‘traditional drink’

Conventional context 1 (with a measure phrase): Maria brought two bowls full of traditional drink:

49a  \textit{Maria yanda yakuba xâa be dju wi}  
Maria two traditional drink bowl in bring  
‘Maria brought two bowls with (the) traditional drink’

Conventional context 1 (without a measure phrase): Maria brought two bowls full of traditional drink:
49b  *Maria yanda yakuba*  *dju wï*
Maria two traditional drink bring
‘Maria brought two (bowls/containers with) traditional drink’

Conventional context 2: someone dropped two bowls full of traditional drink and one big puddle was formed on the floor:

49c  *Yanda yakuba*  *l-apa*
Two traditional drink 1-fell
‘Two (bowls of) traditional drink fell down’

Unconventional context: someone dropped two clearly individuated drops of traditional drink. One near the school, another near the health unit:

49d  *Yanda yakuba*  *pe~pe~pe*
Two traditional drink drip~RED
‘Two (drops of) traditional drink dripped (in different events)’

Awïla ‘honey’

Conventional context (with a measure phrase): someone brought two containers full of honey:

50a  *Yanda awïla xãa be dju wï*
Two honey bowl in bring
‘(Someone) brought two (bowls of) honey(s)’

Conventional context (without a measure phrase): someone dropped two containers with honey and one puddle was formed on the floor:

50b  *Yanda awïla*  *l-apa*
two honey i-fall
‘Two (drops of) honey fall’

Unconventional context: someone was carrying a container full of honey. On the way, one drop fell near the school and another near the health unit:

50c Yanda awila pe-pe-pe
two honey drip.RED
‘Two (drops of) honey dripped (in different events)’

Non-liquid stuff nouns can also corroborate the hypothesis that coercion does not play a role in the combination of some mass nouns with numerals in Yudja:

Eta ‘sand’

Conventional context: the children went to the beach to play. When they returned they brought three containers filled with sand:

51a Txabiù ali eta awa-wa
three child sand get.RED
‘The children got three (containers with) sand (from the beach)’

Conventional context: children lifted up three portions of sand:

51b Ali txabiù eta ilàu
child three sand lift
‘Child(ren) lifted up three (portions of) sand’

Unconventional context: the children brought one bowl full of sand from the beach. While they walked, they dropped a little bit of sand near the school, and a little bit near the hospital (in the drawing the drops were different in size and form):
51c *Yanda ali eta apa~pa*
   two child sand drop~RED

Literal: ‘Children dropped two (drops of) sand(s) (in different events)’

To start with, completely different from *y’a* ‘water’ and *apeta* ‘blood’, *eta* ‘sand’ has no possible standard container associated to it. Yudja consultants make this comment and that is pretty standard in other cultures too. We do not carry sand in containers, except in highly specific contexts. In that sense, a bowl, which is a standard container for other nouns, is not standard for *eta* ‘sand’, just because no container is associated to this noun. As a consequence, examples (51a), (51b) and (51c), where the numeral can be combined with *sand* without a measure unit, are not cases of coercion.

As we have seen for *yakuba* ‘traditional drink’ and *awïla* ‘honey’, non-liquid stuff nouns can also occur with measure phrases (52a), although this is not a requirement, as we can see in (52b):

*Yukïdï* ‘salt’

Conventional context 1 (with a measure phrase): someone brought two bowls full of salt:

52a *Yanda yukïdï dju xãa be wi*
   two salt with bowl in bring
   ‘Someone brought two bowls with salt’

Conventional context 1 (without a measure phrase): someone brought two bowls full of salt:

52b *Yanda yukïdï wi*
   two salt bring
   ‘(Someone) brought two (containers with) salt’

Standard context: someone dropped two bowls full of salt:

52c *Yanda yukïdï l-apa*
Two salt 1-fall

‘Two (bowls of) salt fell’

Standard context: Maria dropped two bowls (clearly individuated) of different sizes on the floor and they formed one single puddle of salt:

52d  *Maria yunda yukïdi apa*

Maria two salt fall

‘Maria dropped two (containers of) salt’

Standard context: some children brought two bowls of salt to the table. They decided to play with salt and make an “X” with it:

52e  *Yunda ali yukïdi maku ebïkarahu*

Two child salt make cross

‘Children make a cross with two (containers with) salt’

Unconventional context: someone was walking with a bowl and two small drops of salt fell: one near the school and another near the health unit:

52f  *Yunda yukïdi apa~pa*

two salt spill~RED

Literal: ‘Someone spilled two (drops of) salt’

All the examples below corroborate that ‘stuff’ nouns (in these cases, non-liquid) can be combined with numerals without measure phrases:

*Açucar* ‘sugar’

Conventional context 1: someone brought two containers full of sugar:

53a  *Yunda açucar dju wi*
Two sugar bring
‘(Someone) brought two (containers of) sugar’

Conventional context 2: someone dropped two bowls and they formed one single pile of sugar on the floor:

53b  $\textit{Yu\text{u}da \text{ açucar au}$  
Two sugar have
‘There are two (bowls of) sugar (on the floor)’

Conventional context 3: someone dropped two bowls with sugar:

53c  $\textit{Yu\text{u}da \text{ açucar l-apa}$  
Two sugar 1-drop
‘Someone dropped two (containers with) sugar’

Conventional context 4: children had two bowls of sugar on the table. They decided to play with salt and make an “X” with it:

53d  $\textit{Yu\text{u}da \text{ ali açucar maku ebikarahu}$  
two child sugar make cross
‘Children make a cross with two (containers with) sugar’

Unconventional context: someone was walking with a bowl and two small drops of sugar fell: one near the school and another near the river:

53e  $\textit{Yu\text{u}da açucar apa~pa}$  
two sugar spill~RED
Literal: ‘Someone dropped two (drops of) sugar’

$\textit{Ikaha}$ ‘fat’
Conventional context: someone brought two containers full of fat:

54a  
\[\text{Yanda ikaba dju wï}\]  
Two fat bring  
‘Someone brought two (containers with) fat’

Conventional context: two bowls of fat fell and one puddle was formed on the floor:

54b  
\[\text{Yanda ikaba l-apa}\]  
Two fat INTR-fall  
‘Two (containers with) fat fell’

Unconventional context: someone brought one bowl with fat and two clearly individuated drops of fat fell: one near the school and another near the river:

54c  
\[\text{Yanda ikaba l-apa}\]  
Two fat I-fell  
‘Two (bowls with) fat(s) fell’

\textit{Puju} ‘beans’

Conventional context: Someone brought two containers full of beans:

55a  
\[\text{yanda puju dju wï}\]  
Two beans bring  
‘(Someone) brought two (containers with) beans’

Conventional context: someone was carrying two bowls full with beans. At some point the person dropped these two bowls, and one big puddle of beans was formed on the floor:

55b  
\[\text{yanda puju l-apa}\]  
Two beans I-fall
‘Two (containers of) beans fell’

Unconventional context: someone was carrying a bowl with cooked beans and two small portions of beans fell: one near the school and another near the health unit:

55c  *Yanda puju apa~pa*
    two  beans  drop~RED
  Literal: ‘Someone dropped two (portions of) beans’

*Makua ‘cotton’*

Conventional context: someone brought two rolls full of cotton:

60a  *Yanda makua dju wi*
    Two  cotton  bring
  ‘(Someone) brought two (rolls of) cotton’

Unconventional context: someone was carrying an amorphous amount of cotton and two clearly individuated balls of cotton fell on the floor, one near the school another near the river:

60b  *Yanda makua bidiin*
    two  cotton  fall
  ‘Two (balls of) cotton fell’

*Awatxi’i ‘rice’*

Conventional context 1: Maria brought two bowls full of rice:

61a  *Maria yanda awatxi’i dju wi*
    Maria  two  rice  bring
  ‘Maria brought two (bowls with) rice’
Conventional context 2: someone dropped two bowls and they formed one puddle on the floor:

61b  Yanda awatsci'i l-apa
    Two rice 1-fall
    ‘I dropped two (bowls with) rice (on the floor)’

Unconventional context: Maria was serving rice for the children and while she was doing that two small portions of rice fell over the chair:

61c  Yanda awatsci'i pïkaba tsade l-apa
    two rice chair INT-drop
    ‘Two (small portions of) rice fell over the chair’

Asa ‘flour’

Conventional context: Maria brought two bowls with flour:

62a  Maria yanda asa dju wi
    Maria two flour bring
    ‘Maria brought two (bowls with) flour’

Conventional context 2: children had two bowls of flour in the table. They decided to play with flour and make an “X” with it:

62b  Yanda ali asa maku ebïkarahu
    two child flour make cross
    ‘Children made a cross with two (containers with) flour’

Unconventional context: someone was walking with a bowl full of flour. On the way, two small drops of flour fell: one near the school and another near the health unit:
Nouns that denote natural phenomena (which are a particular class of ‘stuff’ nouns) can also be combined with numerals without measure phrases in Yudja. Note that this is not a case in which a conventional packager can be implied because this kind of noun cannot be associated, in any context, to a container. In fact, combining this kind of noun with numerals is difficult, and is only possible in very specific contexts:

_Amana_ ‘rain’

Context: there are three villages that are next to each other: Diauarum, Tuba Tuba and Paksamba. A person in Tuba Tuba looked to the left and saw that it was raining in Diauarum. The same person looked to the right and saw that was raining in Paksamba. In this context, the person can say:

63  _yauda ama na a la_
    two  rain   fall
   ‘Two rain(s) fell’

Group 2: Nouns formed with the morpheme _atxa_

Some nouns in Yudja are formed with the morpheme _atxa_ not only in counting contexts, but in any occurrence of the noun. The nouns that necessarily occur with this morpheme are: _pitxa_ ‘fish’ and _ikuritxa_ ‘saliva’, _i’akua atxa_ ‘nasal secretion’, _abu nana ma atxa_ ‘milk’ and _kania atxa_ ‘meat’. Consider first the noun _ikuritxa_ ‘saliva’:

_ikuritxa_ ‘saliva’

Context: The dog let one drop of saliva fall near the hospital and another near the school:
The dog dripped two (drops of) saliva (in different events)

Context: there are two clear individuated drops of saliva on the floor:

There are two saliva(s) over there

In the case of the noun ‘saliva’, no container can be associated with this noun, except if we create a very specific context about an experiment in a laboratory using this substance. However, as this use is not standardized, the use of saliva as a count noun in languages such as English does not sound natural, but it is in Yudja. Another noun that occur necessarily with atxa is i’ãkua itxa ‘nasal secretion’. There are no possible containers associated with the noun i’ãkua itxa ‘nasal secretion’. In that aspect it is similar to ‘saliva’, so in this case we did not differentiate between conventional and unconventional contexts:

i’ãkua itxa ‘nasal secretion’

Context: two clearly individuated portions of nasal secretion drop on the floor:

Two drops of nasal secretion fell on the floor (in different events)

Context: there are two drops of nasal secretions on the floor:

‘There are two (drops of) nasal secretion over there’

A liquid noun that can make use of containers is abnanama atxa ‘milk’:
Abuanama atxa ‘milk’

Conventional context: Anana carried two bowls with milk:

66a Anana yanda abuanama atxa/itxa dju txə

Anana two milk bring

Literal: ‘Anana brought two containers/units with milk’

Unconventional context: someone was carrying a bowl and dropped two drops of milk on the floor, one near the school and one near the health unit:

66b Yauda abuanama itxa l-apa

two milk i-drop

‘Someone dropped two (drops of) milk’

Non-liquid nouns can also have atxa as part of their composition. That is the case for pitxa ‘fish’ and kania atxa ‘meat’ presented below:

Pitxa ‘fish’

Conventional context: Yaba cut a big fish in two pieces:

67a Yaba yanda pitxa akiri

Yaba two fish cut

Literal: ‘Yaba cut two (pieces of) fish’

Note however that the morpheme txə in pitxa does not behave as a measure phrase in this case. That is clear if we consider the unconventional context below:

Unconventional context: during a party in the Tuba Tuba village, someone was eating a fish and let a piece fall near the fire and another piece fall near the river:
The consultants’ comments on *pitxa* is that, taking into consideration the sentence in (67b), it can only refer to big pieces of fish or a whole fish, not to the small pieces presented in the context. Now consider the noun ‘meat’:

*Kania atxa* ‘meat’

Conventional context: Yaba cut a small paca in two pieces.

68a $\text{Yaba } yauda \text{ kania atxa akirî}$

‘Yaba cut two pieces of meat’

Unconventional context: during a party in Tuba Tuba, three pieces of meat fell on the floor: one near the school, another near the health unit and another near the river:

68b $\text{Txabîu } kaniai \text{ atxa bidîtu}$

‘Three pieces of meat fell’

Without *atxa*, the only possible reading is one that refers to the animal itself or big pieces of meat (like an animal divided in two).

The only case that it does not seem that *atxa* is part of the word is in the case for *epa* ‘wood’. Yudja has a series of measure phrases that can be used to refer to small portions of masses. Below we present a series of examples based on the noun *epa* ‘wood’, which can refer to clear ‘individuals’ (trunks or trees) in opposition to portions of wood. Consider the example below:
This sentence could be true in a scenario where someone is cutting the whole tree or if we are talking about trunks of wood, which are usually big. If we refer to small pieces, such as in all the examples presented so far for unconventional containers, then measure phrases are obligatory:

69b  *Yanda epa  akuata  lakiri~kiri*  
two  wood  trunk/piece  cut~RED  
‘(Someone) cut two trunks of wood/pieces of wood (in different events)’

69c  *Yanda epa  atxa  lakiri~kiri*  
two  wood  small piece  cut~RED  
‘(Someone) cut two small pieces of wood (in different events)’

69d  *Yanda epa  itxuk’i  lakiri~kiri*  
Two  wood  very small piece  cut~RED  
‘(Someone) cut two very small pieces of wood (in different events)’

To exemplify this fact in a context, consider the example below:

Conventional context: Txapina cut two pieces of wood to clean the plantation:

70  *Yanda epa  atxa  lakiri~kiri*  
Two  wood  small piece  cut~RED  
‘(Someone) cut two pieces of wood (in different events)’

It is important to make a few generalizations about the meaning of some nouns discussed here. What we have seen so far is that *epa* ‘wood’ without the measure item *atxa*
refers to a tree or a really big piece of wood and in this case *atxa* can be replaced by another morpheme associated to a measure unit. Note however that *atxa* is not productive as a measure unit in the language with other nouns.

For some of these cases, *atxa* differentiates possible interpretations for each noun. For instance, the meaning of *ahuana* without *txa* is breast. In some cases, the meaning of a word without the morpheme *atxa* is unclear. One of these cases is *pitxa* ‘fish’. There is no occurrence of the root *pi*- by itself. The word *fish* is always composed of *-txa*, even in scenarios without numerals:

```
71 Una pitxa ixu
1s fish eat
‘I ate fish/fishes’
```

Another possible analysis for *atxa* is that it is a lexicalized classifier as it seems to be related to portions, measure phrases. It may be the case that Yudja used to have classifiers historically and lost them and *atxa* is a trace of this type of classifier morphology. A rare situation that *atxa* is used clearly as a measure unit is with the noun *epa*, which can be used with other measure units (see 69a to 69d) and also can occur without *atxa* meaning ‘tree’. In this case, *atxa* is used to distinguish meaning from an object and its parts:

```
72 Epa daeku na
Tree overthrow 1s
‘I overthrow the tree/trees’
```

In sum, it is an open question what is the status of *atxa* in Yudja. An in-depth study of this item is needed to better understand its possible uses and interpretations.
Discussion

In the beginning of this section we have seen that, in English, mass nouns can be aligned to two different patterns concerning their combination with numerals. I repeat here these patterns:

(73a) English mass nouns and numerals

<table>
<thead>
<tr>
<th>Attested pattern 1: nouns like blood</th>
<th>Attested pattern 2: nouns like wine</th>
<th>Unattested pattern 1</th>
<th>Unattested pattern 2</th>
</tr>
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<tbody>
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<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Can nouns be combined with numerals without measure phrases in unconventional contexts?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

We observed in this section that nouns in Yudja can be directly combined with numerals, as presented below:

(73b) Yudja (a number-neutral language)

<table>
<thead>
<tr>
<th>Nouns that denote substances and individuals</th>
<th>Unattested pattern 1</th>
<th>Unattested pattern 2</th>
<th>Unattested pattern 3</th>
</tr>
</thead>
<tbody>
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<td>Can nouns be combined with numerals without measure phrases in conventional contexts?</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Can nouns be combined with numerals without measure phrases in unconventional contexts?

| Yes | No | No | Yes |

The table above highlights an important aspect about Yudja nouns. There is no distinction between the use of conventional or unconventional containers when nouns are combined with numerals in this language. In other words, whether or not a conventional container is implied, there is no differentiation in the distribution of a given noun. This is strong evidence that coercion (universal packager) does not play a role in Yudja.

The facts in Yudja are evidence for the hypothesis that nouns may be used as count or mass according to the context in this language. In the literature (Link 1983, Chierchia 1998a, 1998b and Chierchia 2010), it is assumed that counting requires access to atomic parts. The question in Yudja is how to determine what counts as atoms in the denotation of nouns such as blood, water, and sand. I suggest that nouns in Yudja include an atomic counting function (which I claim to be a non-overt classifier) relying on a contextual parameter in order to determine what counts as their minimal parts. This proposal is inspired by Rothstein's work (2004) and (2010). Rothstein argues that events (2004) and nouns (2010) have their denotation in the count domain, and that the denotation of all verbs and nouns includes a contextual atomic function $k$ that determines the minimal parts in their denotation. Once these parts are defined, nouns can be combined with numerals. This analysis will be presented in the next section.

5. **On a contextual parameter for counting in Yudja**

The literature on countability relies on the assumption that counting is counting atoms. A first and central question to ask is how we define atoms. When I say ‘There are three cats on the bed’ the things that are counted are cat-atoms. Nouns like cat have natural atoms in their denotation. There is a family of easily identifiable properties that individual cats always have, in every context. If alive, they have a head, a body, four legs, a tail, etc. Because we know these properties, what counts as a cat and what counts as a body-part of a cat is stable across contexts. Other count nouns like wall have a less straightforward denotation.
Take as an example a medieval castle (based on Rothstein 2010; 374). There is a big building in the middle, which is surrounded by a thick wall in form of a square. Now, we might refer to this wall as ‘the wall of the castle’, in which case we count it as a wall-atom. Or we might refer to parts of this wall as walls themselves, as when we talk about the northern wall of the castle. Of course, we cannot mix these different ways of counting walls. That is, the ‘northern wall’ and the ‘wall of the castle’ cannot be counted as two walls in the same context. For instance, if someone asks the (funny) question ‘How many walls are there in the castle?’ we cannot answer ‘there are two walls, the northern wall and the wall of the castle’. This example shows that wall-atoms are not natural atoms as they vary with the context.

Rothstein (2010) discusses the idea that we do not need natural atoms for counting. In the author’s proposal, the basic denotation of a noun like wall (aka the root noun meaning) is a set of wall-atoms of different kinds, possibly overlapping. For instance, the root noun meaning of wall in our example includes both the wall of the castle and the northern wall of the castle. We cannot count the members of the root noun meaning of wall because the set includes overlapping atoms of different kinds. As a consequence, before we can count walls, i.e. before we can combine a numeral with the noun wall, we need to select a type of wall-atoms to be counted.

How are atoms selected from a root meaning according to Rothstein (2010)? Rothstein introduces the notion of a context as a set of objects. A context k is a subset of the universe of discourse M. A context is a set of objects of all kinds (walls, fences...). Given any root noun meaning N_root and a context k, the intersection N_root ∩ k is a set of N-atoms of the same kind. This entails that for any x,y ∈ N_root ∩ k, if x⊄ y then x and y do not overlap. A function COUNT_k is used to select atoms of a particular kind in a root noun meaning N_root.

For Rothstein, count nouns derived with COUNT_k are not sets of individuals, but sets of pairs of an individual and the context k, i.e. the context in which the first member of the pairs count as atoms:

\[
\text{COUNT}_k (N_{\text{root}}) = \{ \langle d,k \rangle : d \in N \cap k \} \quad (\text{Rothstein 2010; 264})
\]

\[
\text{COUNT}_k (\text{Wall}_{\text{root}}) = \{ \langle d,k \rangle \mid d \in \text{Wall}_{\text{root}} \cap k \}
\]

Note that k appears as a parameter of the function k, i.e. the value of k is chosen once and
for all in a given context of utterance.

Our proposal is to exploit this difference between natural atoms and non-natural atoms to analyze count and mass nouns in Yudja. Essentially, we say that all nouns in Yudja behave like *wall* does in English. We have seen that nouns cannot be counted directly in Yudja, even substance-denoting nouns like *apeta* ‘blood’. We suggest that the basic denotation of *apeta*, for instance, is a set of parts of blood. These parts are of many different kinds: drops, tubes, puddles and these parts might overlap.

When a noun such as *apeta* is counted, we select a particular type of part of blood in the set, which we treat as atoms. For instance we select puddles of blood. It means that in this particular context, if we utter (in Yudja) ‘there are three bloods on the ground’, we have chosen to count puddles of bloods, i.e. we have decided that what counts as blood atoms are puddles of blood.

We will simplify Rothstein’s analysis. As in her analysis, root noun meanings are sets of atoms of different kinds. An atomic function $f$, which is relative to a context $c$, is used to select one kind of atoms in a root noun meaning in $c$. Given a context $c$, the function will take members of the root noun meaning and output 1 if they are atoms of the right kind, and 0 otherwise. This function would be part of the meaning of nouns like *wall* in the form of a non-overt classifier\textsuperscript{12}. Therefore, the meaning of nouns in Yudja is complex. It consists of a root noun meaning (like √blood) and an atomic function:

\textsuperscript{12} The non-overt classifier can optionally be overt, because measure phrases are not required in this kind of construction, but they can occur. For example:

**Salt**

With a measure unit:

1a \begin{tabular}{lllllll}
  i & Yauda & yukïdï & dju & xãa & he & wi \\
  two & salt & with & bowl & in & bring \\
\end{tabular}

‘(Someone) brought two bowls with salt’

1b \begin{tabular}{lllllll}
  i & Yauda & João & yukïdï & dju & xãa & he & wi \\
  Two & João & salt & with & bowl & in & bring \\
\end{tabular}

‘João brought two bowls with salt’

1c \begin{tabular}{lllllll}
  i & Yauda & João & yukïdï & dju & xãa & he & wi \\
  João & two & salt & with & bowl & in & bring \\
\end{tabular}

‘João brought two bowls with salt’

Without a measure unit:

1ia \begin{tabular}{lllllll}
  i & Yauda & yukïdï & wi \\
  two & salt & bring \\
\end{tabular}

‘(Someone) brought two (containers with) salt’

1ib \begin{tabular}{lllllll}
  i & João & yauda & yukïdï & dju & wi \\
  João & two & salt & with & bring \\
\end{tabular}

‘João brought two containers with salt’
Atomic function

\[ [[\text{blood}]](c) = \{ x: x \in \sqrt{\text{blood}} \land f_C(x) = 1 \} \]

The atoms derived from this operation do not overlap:

Non-overlapping condition

\[ \forall x, y, c \ [ f_C(x) = 1 \land f_C(y) = 1 \land x \neq y ] \rightarrow \neg xOy \]

The advantage of this adaptation of Rothstein is its simplicity: the denotation of any noun is a set of individuals, rather than a set of pairs of individuals and Rothsteinian-contexts. Of course, the denotation of nouns is still context sensitive.

A similar way to formalize these questions would be to say that Yudja has a covert generalized measure phrase, which would function like a classifier in classifier languages or plurals in number-neutral language, as discussed by Chierchia (2010). Chierchia (2010) relies on the same principles as Rothstein. First, we count the minimal elements to which a property applies (i.e., we count atoms). Second, the property used for counting must have stable minimal entities. As a consequence, if in a property \( P \) in a context \( c \), all atoms are vaguely specified, then counting is not possible. In order to illustrate this idea, consider the difference between a noun such as ‘dog’ and a noun such as ‘rice’. For any two contexts \( c \) and \( c' \), an atom of ‘dog’ in context \( c \) is also an atom of ‘dog’ in context \( c' \). A mass noun such as ‘rice’ has unstable atoms in its denotation. That is, something that counts as an atom in the denotation of ‘rice’ in context \( c \) will not necessarily count as an atom in context \( c' \), which makes this noun less likely to be counted.

In the author’s proposal, nouns can have a number-neutral denotation (in the case of number-neutral languages and number-marking languages) or can denote kinds (in the case of classifier languages)\(^\text{13}\).

Nouns that denote kinds must be shifted to denote properties with atomic parts in order to combine with numerals and other counting operators. In classifier languages,

\(^\text{13}\) If nouns are kind denoting, when combined with numerals they will have to be transformed in property first. That is a natural slot for classifiers in Chierchia’s analysis (2010).
classifiers do this shift. When nouns denote properties an operator must check that the properties have atomic parts: this is the function of number morphology (singular and plural) in number-marking languages.

In both types of languages, an atomic function can extract the smallest elements from properties. Chierchia’s atomic function is presented below:

77 Definition of AT (atomic function) (Chierchia 2010)

a. If P is of type <e,t>, AT (P) = \{x ∈ P: \forall y ∈ P [ y ≤ x → x = y] \}

If x is of type e, AT (x) = AT (λy [ y ≤ x ])

b. Remark: for any x, AT (x) ⊆ AT (U) (i.e. AT (x) always yields absolute atoms)

Chierchia (2010; 113, item (29b) and (29c))

The application of this atomic function to a noun’s denotation is exemplified below:

78a AT (\{a, b, a⊕b\}) = \{a, b\}

AT (\{ Maria, João, Maria⊕João\} = \{Maria, João\}

78b AT (\{a⊕b, b⊕c, a⊕b⊕c\}) = \{a⊕b, b⊕c\}

AT (\{Maria⊕João, João⊕Carla, Maria⊕João⊕Carla\}) = \{Maria⊕João, João⊕Carla\}

78c AT (a⊕b⊕c) = \{a, b, c\}

AT (Maria⊕João⊕Carla} = \{Maria, João, Carla\}

(Chierchia 2010; 113, item (29a))

In number-marking languages, AT applies to a property P and returns the set of its atoms relative to a context. Once the atoms are identified, nouns can be combined with numerals. This function cannot extract atoms out of the denotation of mass nouns, because atoms are not precisely defined for mass nouns, but are vague elements. In number-marking languages number-morphology is an instantiation of atomization, i.e., number morphology filters out non-atomic properties. Number-morphology in number-neutral languages applies
as described by the author (Chierchia 2010; 135): “being composed solely of stable individuals not closed under $\cup$ (and is coded in the singular morpheme); being generated by a set of stable individuals via $\cup$-closure (and is coded in the plural morpheme)”. In this perspective, mass nouns such as ‘rice’ do not pass the atomicity check (SG (AT(RICE)) and PL(RICE)) because the properties they denote have no stable atoms (in any context). Below we illustrate the workings of the atomicity function for number-marking languages:

79 Number-marking languages (English)

![Diagram of atomicity function for number-marking languages]

(based on Chierchia 2010; 142, item (81))

In classifier languages nouns are uniformly mapped onto kinds. In this perspective, no automatic type adjustments are possible to turn kinds into properties in number-noun constituents. As a consequence, overt morphemes (of type $<k, <e,t>>$) must intervene between numbers and their nominal arguments which explains the emergence of classifiers. In Chierchia’s perspective, classifiers are instantiations of AtP:
If we used this proposal to explain Yudja data, we would have to say that the equivalent of singular/plural morphology and classifiers in Yudja is a covert generalized measure phrase. In the analysis à la Rothstein presented in the beginning of this chapter, the atomic function that selects atoms which is slightly different from the one used in Chierchia’s proposal. The atomic function in Chierchia’s proposal is a filter. It checks if the denotation of a noun is consistent with counting. If it is not, it does not modify it to make it consistent with counting. In my analysis, an atomic function is needed by default for any counting operation because there is no pre-lexical atom and as a consequence the function is not checking what can be count or not because, in principle, based on the data presented here, all nouns can be count. As a consequence, atoms are not given a priori; they are always selected relative to a context.
6. Quantifiers

One criterion used to distinguish count nouns and mass nouns cross-linguistically is the distribution of quantifiers. In some languages such as English (vide section 1) some quantifiers are restricted to mass nouns and others to count nouns. In Yudja, we document four quantifiers: the first pair, *kînana binaku*¹⁴ ‘few’ and *itxîbî ‘many’, quantify over clearly individuated portions of nouns, just like numerals; the second pair, *urahu ‘big, a lot’ and xînaku ‘a little’ quantify over non-individualized portions. None of them is restricted to a class of nouns, but they generate different interpretations when combined with a noun $x$. Consider the examples below:

*Itxîbî ‘many’/ Kînana binaku ‘few’: clear individualized portions*

$y’a ‘water’$

83a *itxîbî $ y’a*

many water

‘(There are) many clear individualized portions of water’

83b *kînana binaku $ y’a*

few water

‘(There are) few clear individualized portions of water’

*apeta ‘blood’*

84a *itxîbî $ apeta*

many blood

‘(There are) many clear individualized portions of blood’

84b *kînana binaku $ apeta*

---

¹⁴ The meaning of the quantifier translated as ‘few’, *kînana binaku*, is derived of two independent words *kînana* and *binaku*. The latter also appears in the composition of the numeral ‘one’, *meme binaku*. It may be the case that *binaku* is a lexicalized classifier that overtly implicates individualized portions/atomization. If this is the case, it is expected that a quantifier containing this lexical item would not apply to events. Now consider the second pair of lexical items that can occur as quantifiers.
few blood

‘(There are) few clear individualized portions of blood’

axixià ‘smoke in the sky before rain’

85a  itxibì axixià

many smoke

‘(There is) many smoke sprawled’

85b  kïnana hinaku axixià

few smoke

‘(There is) few smoke sprawled’

ali ‘child’

86a  itxibì ali

many child

‘(There are) many children’

86b  kïnana hinaku ali

few child

‘(There are) few children’

The four nouns above y’a ‘water’, apeta ‘blood’, ali ‘child’ and axixià ‘smoke’ illustrate the possible results we can get when combining nouns with quantifiers that strongly require clearly individuated portions of a substance/entity. For y’a ‘water’ clearly individuated portions may include drops, puddles, bottles, bowls or any other strategy to individualize substances according to contextual/cultural factors. The same holds for ‘blood’, which could be individualized in portions such as tubes, drops, or puddles, as in the examples for numerals presented in section 5. The nouns axixià ‘smoke’ is usually associated to the smoke in the sky and in this case no container can be associated to this substance in order to individualize portions. Instead, in a context where one can see different ‘smokes’ in the sky, individualized by a space between them, it is possible to combine this noun with these quantifiers. Finally, there are nouns that are naturally atomic and the combination of these
quantifiers is natural, such as *ali* ‘child’ (and any other noun that is strongly naturally atomic such as animals or other nouns referring to people). These examples show that these quantifiers, just like numerals in the language, may combine with any noun as long as clear atoms can be found in the denotation of the noun in the context of utterance, which may also be a consequence of the atomic function proposed in (75). If individualization of portions is not possible, then a noun cannot be combined with these quantifiers, as observed with the nouns *kapūā* ‘fog’ and *makasu* ‘wind’:

<table>
<thead>
<tr>
<th>Language</th>
<th>Example (A)</th>
<th>Example (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>kapūā</em> ‘fog’</td>
<td>many <em>kapūā</em></td>
<td>few <em>kapūā</em></td>
</tr>
<tr>
<td><em>makasu</em> ‘wind’</td>
<td>many <em>makasu</em></td>
<td>few <em>makasu</em></td>
</tr>
</tbody>
</table>

These examples provide further evidence in favor of an atomic function which is necessary in order to combine numerals or the quantifiers *itxibī* ‘many’ and *kinana binaku* ‘few’ directly with nouns. When atoms are not selected, the noun receives a mass interpretation. That is clear when we observe the second pair of quantifiers *urahu* ‘big, a lot’ and *xinaku* ‘a little’. These quantifiers either force a mass interpretation of the nouns, or are interpreted as adjectives (the adjective interpretation is possible with *urahu* only; *xinaku* cannot mean ‘small’). Below I present some examples with the same nouns presented above:

<table>
<thead>
<tr>
<th>Language</th>
<th>Example (A)</th>
<th>Example (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>y’a</em> ‘water’</td>
<td>a <em>urahu y’a</em></td>
<td>a <em>xinaku y’a</em></td>
</tr>
</tbody>
</table>

‘(There is) a lot of water inside a single place’

‘(There is) little water in a single place’
apeta ‘blood’

90a urahu apeta
   a lot.big     blood
‘(There is) a lot of blood inside a single place’

90b xinaku apeta
   a little      blood
‘(There is) little blood in a single place’

axixiã ‘smoke’

91a urahu axixiã
   a lot.big     smoke
‘(There is) one big smoke’

91b xinaku axixiã
   a little      smoke
‘(There is) a little smoke, not much’

ali ‘child’

92a urahu ali
   a lot.big     child
‘(There is) a big child’

92b # xinaku ali
   a little      child

The central characteristic of this second class of quantifiers in Yudja is that they quantify over non-individualized portions of a noun. For that reason, in the examples for y’a ‘water’ and apeta ‘blood’ the translation include that the substance was found ‘in a single place’ which can be any container (bowls, hammocks, canoes) context/culture salient. In the example for the noun axixiã ‘smoke’ the same can be observed (there is a single mass of
smoke in the sky). Note that in this example the meaning ‘a lot’ and ‘big’ are almost synonymous in these cases. That is, a big fog is composed of a lot of fog, so in this case the two possible interpretations associated to urahu are very similar. That is different from a noun that is naturally atomic, such as child. In this case, the most salient and natural interpretation for the speakers is that a child is big (adjectival) over a massive use of the noun child (quantificational), such as in a situation where we can attest a very large number of children in a single place, a crowd.

For the next steps of this research, we are going to test if the use of urahu and xinaku reporting to masses with natural atomic nouns can be attested. One possible outcome will be one were urahu and xinaku cannot be associated to natural atomic nouns such as child meaning a mass. In case it cannot, quantifiers will be the central aspect for the differentiation between two classes of nouns (count and mass). A different outcome would be generated if both adjectival and quantificational interpretations can be associated to any noun in Yudja. The implication of this last possible outcome is that in Yudja the distinction between count and mass nouns would not be made lexically, but according to each context any noun would be able to be count or mass. That however, is a question that needs further empirical evidence.

**Final remarks**

In this paper I discussed the distribution of numerals in Yudja and the implications of their distribution for the characterization of a count-mass distinction in Yudja.

I have shown that nouns that denote individuals and nouns that denote masses can be directly combined with numerals in Yudja, with no need for an overt classifier or measure phrase. I presented an experiment with 20 ‘mass’ nouns in order to observe if coercion is responsible for this unrestricted combination of nouns and numerals. The results show that nouns can be equally combined with numerals in contexts where conventionalized and unconventionalized portions of the substance were presented, differently of English. These results are evidence against coercion (universal packager) in Yudja if we consider that the universal packager depends on clear individualization of the portions and standardized containers.

To explain how the combination of numerals and nouns is established in Yudja, I considered the analysis by Rothstein (2010) and Chierchia (2010). In both approaches, a
contextually atomic function selects what counts as atoms in a context. In this perspective, natural atomicity is not relevant for counting. Then, in Yudja, I discussed that the denotation of nouns is number-neutral and an atomic function selects the relevant atoms in a context. After this operation, and these nouns can be combined with numerals and also with the quantifiers itxibé and kínana hinaku that necessarily take clearly individuated portions.

The facts presented in this paper converge to the conclusion that neither pluralization nor the distribution of numerals can be used as criteria to distinguish count from mass nouns in Yudja. If this distinction is grammaticalized in the language, it may be observed in the distribution of quantifiers, even though further evidence is needed in order to argument in favor of a lexical distinction between count and mass nouns in Yudja. In other words, the remaining question for further research is how strong is a count-mass distinction in Yudja and how it is established, and if it is how.

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