Object Mass Nouns as an Arbiter for the Mass/Count Category

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1. Introduction

Classifier languages are commonly claimed to have no grammaticized lexical mass/count distinction, but rather have this distinction encoded through the syntax and semantics of classifiers (e.g. Chierchia 1998, 2010; Muromatsu 2003, Rothstein 2017). This is the claim we wish to contest by drawing on data from Japanese, a typical classifier language. We provide novel empirical evidence showing that Japanese quantifiers (e.g. *nan-byaku-to-iu* 'hundreds of') can be used as tests for the countability of Japanese nouns in the absence of classifiers. Moreover and more importantly, felicity tests using these quantifiers allow us to test for a linguistic phenomenon, namely object mass nouns (e.g. *furniture* or *mail* in English), which are predicted not to exist in classifier languages according to (Chierchia 2010). Object mass nouns in English have atomic denotations, and yet are infelicitous in counting constructions in direct combination with numerals. In Japanese, it is well known that all nouns are infelicitous in counting constructions when directly combined with numerals, and therefore the use of a classifier between numerical and noun is obligatory. While counting constructions in classifier languages differ from those in languages like English, both have quantifiers that are sensitive to the mass/count distinction. In English, object mass nouns, such as *furniture* have atomic denotations and yet are infelicitous with count quantifiers like *each* and *every—e.g. #each/#every furniture/kitchenware/silverware/cutlery.* We provide evidence that Japanese nouns like *yūbinbutsu* ('mail') have atomic denotations and yet are incompatible with count quantifiers like *nan-byaku-to-iu* ('hundreds of').

We conducted an empirical study assessing the felicity of combining Japanese count quantifiers like *nan-byaku-to-iu* ('hundreds of') with nouns from different conceptual classes. Our results show that Japanese indeed has object mass nouns and *a forteriori* that the Japanese lexical nominal system must be endowed with a grammatical mass/count distinction. This also means that Japanese has a grammaticized lexical mass/count distinction that bears a certain resemblance to that which we find in number marking languages (e.g. English). This contradicts the orthodox view of classifier languages in, e.g. Chierchia (1998, 2010) and Rothstein (2017). We propose a novel semantic analysis of Japanese lexical nouns and classifiers, based on the theory of the mass/count distinction developed in Sutton & Filip (2016).

2. Background

One of the most influential analyses of classifier languages was proposed in Chierchia (1998, 2010), couched in a compositional type-theoretic analysis. According to Chierchia (2010), nouns in classifier languages uniformly denote kinds ($\langle k \rangle$), and numerals are adjectival (of type $\langle \langle e,t \rangle, \langle e,t \rangle \rangle$); consequently, overt morphemes, namely classifiers of type $\langle k, \langle e,t \rangle \rangle$ must intervene between numerals and their nominal arguments.

There is, however, a growing body of work showing that a more nuanced view of the nominal systems of classifier languages is warranted (Bale & Barner 2012; Doetjes 2012; Inagaki & Barner 2009; Li 2009; Sudo 2016, 2017). For example, Inagaki & Barner (2009) use comparison tasks to show that, in classifier-less 'more than' constructions, nouns like *kutsu*

('shoe') and *kagu* ('furniture') are judged by native speakers according to cardinality of individuals, but substance nouns like *karashi* ('mustard') are judged according to volume. These 'more than' constructions were not only classifier-less but also lacked any grammatical cues of individuation that could have triggered a cardinality or volume comparison. According to Inagaki & Barner (2009), some Japanese nouns encode individuation even in the absence of count syntax.

In support of a stronger claim, that there are reflexes of the mass/count distinction in at least some classifier languages, for Japanese, Sudo (2016, 2017) argues that certain quantifiers differentially select for countable nouns. For instance, *nan-byaku-to-iu* 'hundreds of' and *dono* N *mo* 'whichever' are felicitous with count nouns (e.g. *hon* 'book') but infelicitous with mass nouns (e.g. *ase* 'sweat'). In Sudo (2016, forthcoming), this observation is taken to mean that there are nouns with countable denotations in Japanese; that is, individuation is directly encoded in Japanese nouns, rather than in count syntax via a classifier construction.

Object mass nouns are of key importance in determining whether or not a language has a mass/count distinction, because they provide evidence for the mismatch between conceptual individuation and grammatical mass behavior. Such nouns denote entities with an atomic structure, but are nevertheless infelicitous in counting constructions (e.g. *#I bought two furnitures*). Chierchia's (2010) explanation for object mass nouns is the copycat effect, according to which atomically stable nouns like *furniture* copy mass noun properties as a result of lexical choice. The theory of Chierchia (2010) predicts that object mass nouns should not exist in classifier languages, because all nouns uniformly denote kinds. Since all nouns share the same properties, there are no separate classes of nouns that could be copied from. In addition to the evidence in (Inagaki & Barner 2009; Sudo 2016, 2017), proof of object mass nouns in Japanese would mean that quantifier phrases like *nan-byaku-to-iu* 'hundreds of' are not simply sensitive to the atomic structure of nouns or individuation. In other words, notional (non-)atomicity or (non-)individuation cannot account for the countability of Japanese nouns.

3. Empirical study

Building mainly on the observations about Japanese data in (Sudo 2017), we designed a study in which we asked 53 native speakers (in an online survey on www.crowdworks.jp) to judge the felicity of 120 sentences, including distractor sentences, on a five point Likert scale ranging from 1, *hen da* ('odd'), to 5, *yoi* ('OK'/`good'). The sentences contained a combination of the quantifier *nan-byaku-to-iu* ('hundreds of'), which does not require a classifier, with concrete nouns denoting: stuff (e.g. *yuki* 'snow' in (1)); inanimate as well as animate discrete entities/individuals (e.g. *onna no hito* 'woman' in (2)); collections of discrete entities (e.g. *yūbinbutsu* 'mail' as in (3)).

(1) 昨日雪が降った。#何百という雪はもう溶けてしまった。
   kinō   yuki ga fu-tta; **nan-byaku-to-iu   yuki** wa mō   toke-te shima –tta
   yesterday snow NOM fall-PST; **what-hundred-to-say snow** NOM already melt-TE finish-PST
   'It snowed yesterday. #Hundreds of snow melted already.'

(2) トランプ氏が大統領になったあと、何百という女の人がワシントンで練り歩いた。
   Toranpu-shi   ga   daitoryō ni na-tta   ato, **nan-byaku-to-iu   onna.no.hito**
   Trump-president NOM president ACC become-PST after, **what-hundred-to-say woman**
   ga   washinton de   neriarui-ta.
   NOM Washington LOC march-PST
   'After Trump became president, hundreds of women marched in Washington DC.'

(3) この有名なアイドルグループはファンレターが青くて、ピンクの封筒だけで貰っている。先週も**#何百という**郵便物を貰っていた。
kono yūmei-na   aidorugurūpu wa fanretā ga   aoku-te pinku no fūtō   dake de
this famous-ADV band   TOP fanletter NOM blue-TE pink GEN envelope only   with
mora-tte   iru;   senshū mo **nan-byaku-to-iu**   **yūbinbutsu** o   mora-tte i-ta
become-TE PROG; lastweek too **what-hundreds-to-say mail**   ACC get-TE PROG-PST
'This famous band gets fan letters exclusively in pink and blue envelopes. Last week they got #hundreds of mail.'

Sentences with an average rating higher than 3 were categorized as felicitous, whereas sentences with an average rating lower than 3 were categorized as infelicitous. The main results are summarized below in Figure 1.

What emerges from our empirical study is that the quantifier *nan-byaku-to-iu* ('hundreds of') is felicitous with nouns denoting sets of atomic individuals like *onna no hito* ('woman') or *yubiwa* ('ring'), which therefore indicates that they exhibit properties of count nouns. At the same time, *nan-byaku-to-iu* ('hundreds of') is infelicitous with nouns denoting undifferentiated stuff like *yuki* ('snow') or *kemuri* ('smoke'), which suggests that such nouns exhibit a property typical of mass nouns. From this bipartite split, there is some evidence that *nan-byaku-to-iu* 'hundreds of' is a suitable test for determining the countability status of nouns (analogous to e.g. 'hundreds of' in English). Decisively, however, *nan-byaku-to-iu* ('hundreds of)' is infelicitous with nouns like *yūbinbutsu* ('mail'), *kōtsū* ('traffic'), *kaimono* ('shopping goods'), despite the fact that they denote sets of inherently individuable units (atoms). Nouns like *yūbinbutsu* ('mail'), *kōtsū* ('traffic'), *kaimono* ('shopping goods') thus exhibit properties similar to English object mass nouns like *furniture* in so far as they grammatically pattern with nouns denoting undifferentiated stuff, as can be seen in Figure 1, despite denoting atomic individuals. This disconnect between grammatical and notional categories leads to the conclusion that Japanese has object mass nouns, and consequently a grammaticized lexical mass/count distinction.
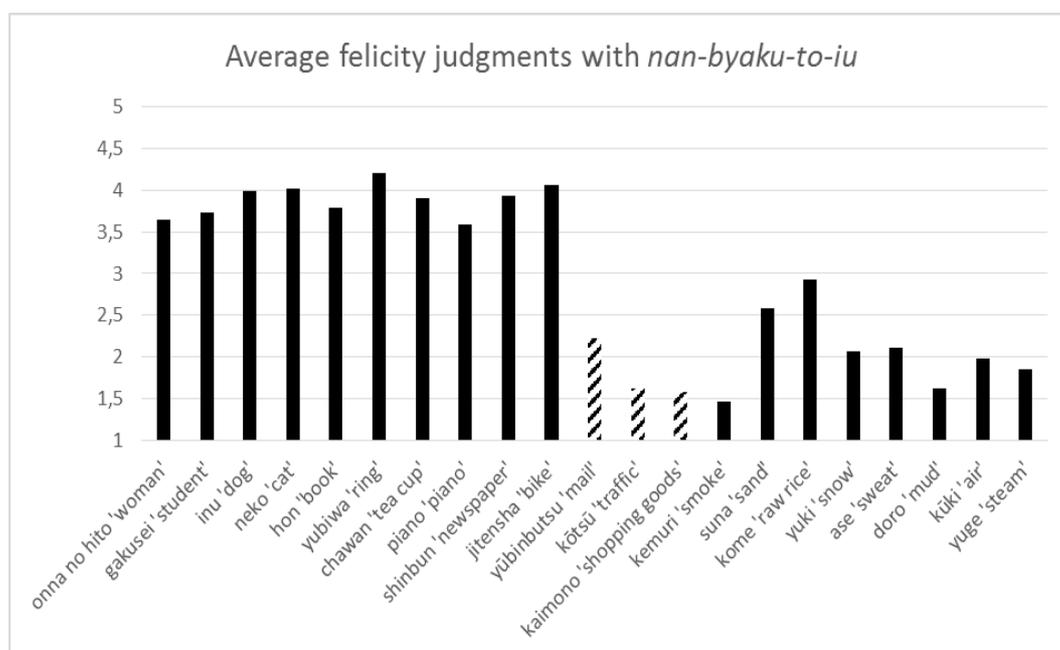

Figure 1: Bi-partite split of Japanese nouns based on their compatibility with nan-byaku-to-iu ('hundreds of')

4. Analysis
Japanese nouns are analyzed as having lexical entries consisting of tuples of the kind of ⟨**qualities, c_base$_P$, presuppositions**⟩, following some independently motivated proposals for

the semantics of nominal predicates in Sutton & Filip (2016)**.** The predicate in the **qualities** slot is a number neutral predicate *P* representing the perceptual/functional properties of the relevant noun. The *counting base* '**c_base$_P$**' is the (possibly overlapping) set of entities that count as 'one' with respect to P. The presuppositions slot is used to track conditions of composition with, e.g., classifiers. For example, the Japanese classifier *bu*, below in (5), requires its argument noun to denote a type of printed material. The *null counting context,* c_0, which represents the union of the interpretations of the predicate at all particular counting contexts, allows overlap in the **c_base**.

Lexical entries make use of product types (e.g. Carpenter (1997)). For example, an expression $\langle X_a, Y_b, Z_c \rangle$ is of type $\langle a \times b \times c \rangle$. We also use projection functions π_1, and π_2 such that $\pi_1(\langle X_a, Y_b, Z_c \rangle) = X_a$ and $\pi_2(\langle X_a, Y_b, Z_c \rangle) = Y_b$.

Object mass nouns are of type $\langle e, \langle \langle e, t \rangle \times t \times t \rangle \rangle$ with entries saturated with c_0 and are not countable because they have overlapping counting bases at c_0 (cf Landman 2016). Count nouns are interpreted at a counting context that specifies disjoint counting base and are of type $\langle c, \langle e, \langle \langle e, t \rangle \times t \times t \rangle \rangle \rangle$. The quantifier *nan-byaku-to-iu* selects nouns that have a countable, non-overlapping **c_base,** hence are infelicitous with object mass nouns. Object mass nouns can still be used in count syntax with an intervening classifier, however. Numerals (4) combine with classifiers (5), which add their own counting context to the context of the noun *yūbinbutsu* ('mail') (6), thereby overwriting the null counting context (as a result of the property of counting contexts in (7)). The combination of these elements yields (8). (8) is felicitous, since $c_i(\textbf{IND}(\text{MAIL}))$ is disjoint (unlike $c_0(\textbf{IND}(\text{MAIL}))$, which is overlapping).

(4) $⟦san⟧ = 3$
(5) $⟦bu⟧ = \lambda n. \lambda P. \lambda c. \lambda x. \langle \pi_1(P)(x), CARDINALITY(x, c(\lambda y. \pi_2 P(y))) = n,$
$\pi_1(P(x)) \subseteq \text{PRINTED. MATERIAL}\rangle$
(6) $⟦yūbinbutsu⟧^{c_i} = \lambda x. \langle \lambda y. \text{MAIL}(y), c_0(\textbf{IND}(\text{MAIL})(x)), \emptyset$
(7) $\forall P. \forall c. [c(c_0(P)) \leftrightarrow c(P)]$
(8) $⟦san\ bu\ yūbinbutsu⟧^{c_i} = \lambda x. \langle \lambda \text{y}. \text{MAIL}(y),$
$CARDINALITY(x, c_i(\lambda y. \textbf{IND}(\text{MAIL})(y))) = 3,\ \text{MAIL} \subseteq \text{PRINTED. MATERIAL} \rangle$

5. Conclusion

Our novel empirical evidence confirms that the Japanese quantifier *nan-byaku-to-iu* ('hundreds of') is a suitable diagnostic test for the count status of Japanese nouns. Moreover, and more importantly, in this way we show that Japanese has object mass nouns, contrary to the prediction in Chierchia (2010) that they should not exist in classifier languages. This has not been shown in any previous work on classifier languages, to the best of our knowledge. Our empirical study shows that there are Japanese quantifiers like *nan-byaku-to-iu* ('hundreds of') that select for count nouns, but reject mass nouns like *yūbinbutsu* ('mail'), *kōtsū* ('traffic'), *kaimono* ('shopping goods'), despite the fact that the latter denote sets of inherently individuable units (atoms). In this respect, such nouns grammatically pattern with mass nouns denoting undifferentiated stuff. But this means that nouns like *yūbinbutsu* 'mail' are grammatically mass, but notionally individuated. These are the hallmark properties of object mass nouns, such as *furniture* in English, which can be found in languages like English with a grammaticized lexical mass/count distinction.

Based on our findings for Japanese, we reject the common view advocated among others in Chierchia (1998, 2010) or Muromatsu (2003) that the mass/count distinction in *all* classifier languages is solely reflected in the syntax and semantics of their classifier systems. Rather, Japanese, as we argue, based on the existence of object mass nouns, has a grammaticized lexical mass/count distinction, which is also reflected in the syntax and semantics of Japanese nouns. If there are classifier languages like Japanese that have a

grammatical mass/count distinction in the lexicon, then the nominal systems of such classifier languages are typologically closer to nominal systems in languages with a bona fide lexical mass/count distinction, like English, than has previously been assumed. This conclusion requires a novel formal analysis of Japanese nouns, numericals and classifiers, which we provide based on Sutton & Filip (2016).

Our empirical and theoretical results raise important questions about the nominal systems in classifier languages. In future studies, we will, therefore, develop a battery of empirical tests with a wider range of quantifiers used as diagnostic tests for the mass/count status of nouns in Japanese, as well as other classifier languages, and also for identification of object mass nouns in such languages.

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