What's the smallest part of spinach? A new experimental approach to the count/mass distinction

The object/substance distinction is cognitive, while the count/mass distinction is linguistic (see the diagnostics in Table 1). According to Chierchia (1998, 2010, 2015), the relevant semantic distinction is *atomicity*: a noun is atomic iff there exists a minimal unit that has the property denoted by the noun. Thus, the minimal unit of 'chair' is a chair, but there is no minimal unit of 'mustard'. In languages like English, which have a fully grammaticized count/mass distinction, the relationship between atomicity and morphosyntax is not direct: e.g., *furniture* is atomic yet mass, while *chocolate(s)* can be either mass or count (see Table 1). There is also much cross-linguistic variation (e.g., *spinach* and *furniture* are mass in English but count in French; *beans* is count in English but mass in Russian).

**Table 1: diagnostics for the count/mass distinction in English**

| diagnostic | count nouns | mass nouns |
|---|---|---|
| indefinite article *a* (count) | √a chair / chocolate / bean | *a furniture/mustard/spinach |
| plural marking (count) | √chairs / chocolates / beans | *furnitures/mustards/spinaches |
| ability to occur in bare (determiner-less) form (mass) | *I bought chair / bean. | √I bought furniture / mustard / spinach / chocolate. |
| *many* (count) vs. *much* (mass) | many chairs / chocolates / beans | much furniture / mustard / spinach / chocolate |

In contrast, in generalized classifier (GC) languages, where plural marking is optional, the relationship between atomicity and morphosyntax is direct: in Korean, only atomic nouns can combine with the plural marker *-tul* (Kim 2005, Choi et al. 2018); in Mandarin, atomic and non-atomic nouns combine with different types of classifiers (Cheng & Sybesma 1998).

Research questions: (i) Does the morphosyntax of the count/mass distinction in a given language affect speakers' interpretation of nouns as atomic vs. non-atomic? OR (ii) Is interpretation driven by semantic universals, independently of language-specific morphosyntax?

Prior literature: In a series of studies that used *the quantity judgment task* (Barner & Snedeker 2005; Barner et al. 2009; Inagaki & Barner 2009), native speakers of both plural-marking and GC languages were asked, "Who has more *chairs/mustard/*etc.?" and had the choice of either multiple small items (judgment by number) or two large items (judgments by volume). These studies tested several different categories of nouns, exemplified in Table 2. The studies found much cross-linguistic similarity (count and object-mass nouns were judged by number, while substance-mass nouns were judged by volume), but they also found effects of language-specific morphosyntax on flexible nouns for speakers of English vs. French vs. Japanese (a GC language). However, the task confounded interpretation with morphosyntax: in English, count nouns were presented in plural form and mass nouns in singular form; in Japanese, all nouns were presented in bare form. Thus, any differences in interpretation, both within and across languages, could be due to the form in which the noun appeared.

**Table 2: Different noun categories, based on cross-linguistic behavior**

| Category | Sample noun | Explanation |
|---|---|---|
| 1. Object-count | chair | Atomic nouns, count-cross-linguistically |
| 2. Flexible-count | bean | Flexible nouns cross-linguistically, count in English |
| 3. Flexible | chocolate | Flexible nouns, both count and mass in English |
| 4. Object-mass | furniture | Superordinate nouns, mass in English |
| 5. Flexible-mass | spinach | Flexible nouns cross-linguistically, mass in English |
| 6. Substance-mass | mustard | Non-atomic nouns, mass cross-linguistically |

Methodology. In order to avoid the confound described above, we devised a new task, the Minimal Part Identification Task (MPIT), in which (after initial training and examples) participants are given a noun in its bare form (no determiners, no plural marking) and asked 'Does *[chair/chocolate/furniture/etc.]* have a minimal unit?' The MPIT tested the six categories in Table

2, and was translated into English, Korean and Mandarin, with 20 native speakers tested per language. The English and Korean speakers also took a Grammaticality Judgment Task (GJT) with sentences containing the same nouns as the MPIT (e.g., *I read about string/strings in the library yesterday*); each noun was tested in both singular and plural forms, in order to determine which form was grammatical for each category. The GJT was not used with Mandarin speakers, since the Mandarin plural marker is ungrammatical with all [-human] nouns.

GJT results (Figure 1): as expected, English speakers judged only the bare singular form as grammatical for mass nouns, and only the plural form – for count nouns, while flexible nouns like *chocolate(s)* were accepted in both forms. Korean speakers accepted the bare form for all nouns (since plural marking is always optional), and accepted the plural form more with atomic than with non-atomic nouns.

**Figure 1: GJT results from speakers of English and Korean**
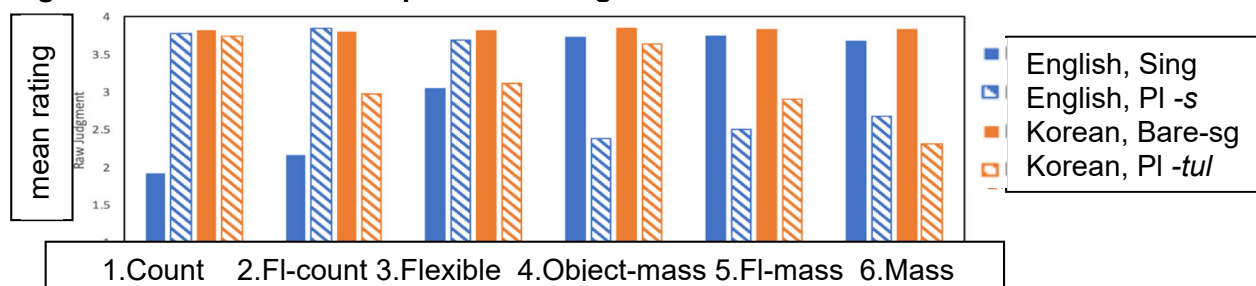


MPIT results (Figure 2): despite the cross-linguistic differences in morphosyntax, the three groups exhibited very similar patterns of judgments, with the most 'minimal unit' judgments for object nouns, the least – for substance nouns, and in-between – for all types of flexible and object-mass nouns. The data were analyzed via mixed-effects models with category and language as fixed effects; significant interactions were followed by pairwise comparisons. While category had a significant effect, pairwise comparisons did not yield differences between groups on any category (with the single exception of object-mass nouns, where Chinese speakers gave more 'minimal unit' judgments than English speakers).

**Figure 2: MPIT results from speakers of English, Korean and Mandarin Chinese**
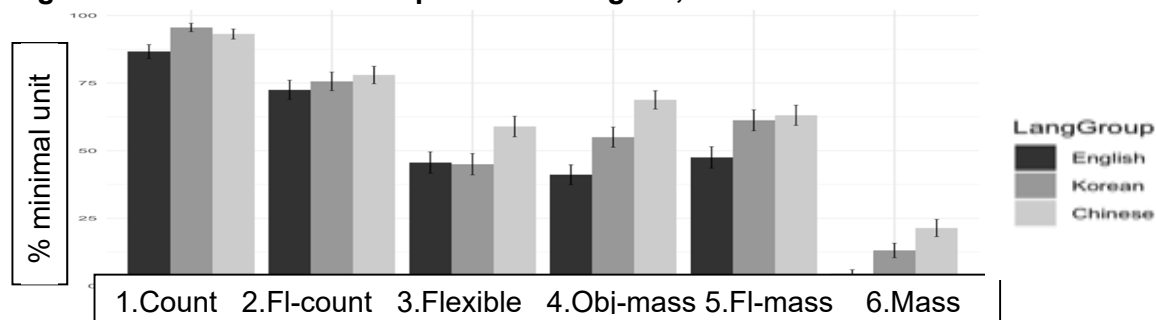


Discussion: We find that interpretation of a noun as atomic or not is very similar across languages. While interpretation affects morphosyntax (atomic nouns are more likely to be count and non-atomic ones - mass, across languages), the opposite is not the case: how we perceive objects vs. substances is *not* influenced by the nominal system of our language.

**Selected References: Barner & Snedeker (2005).** Quantity judgments and Individuation: Evidence that mass nouns count. *Cognition, 97*. **Chierchia (1998).** Reference to kinds across languages. *Natural Language Semantics, 6*. **Chierchia (2010).** Mass nouns, vagueness and semantic variation. *Synthese, 174*. **Inagaki & Barner (2009)**. Countability in absence of count syntax: Evidence from Japanese quantity judgments. In the 8th Annual Conference of the Japanese Society for Language Sciences. **Kim (2005).** The Korean plural marker *tul* and its implications. PhD Thesis, University of Delaware.