

UNIVERSAL AND LANGUAGE-SPECIFIC PATTERNS OF CATEGORIZATION

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Abstract

Previous work on object classification preferences shows that speakers of languages that lack morphological plural marking (like Yucatec and Japanese) display a tendency to match objects by common material, while speakers of languages with morphological plural marking (like English) display a tendency to match objects by common shape. The present paper compares categorisation preferences of English and Japanese speakers with those of Greek speakers. Greek resembles English in that it has morphological plural marking, but contrasts with English in that mass nouns typically do not resist pluralization. Results show that all groups distinguish significantly between countable objects and non-countable substances, but the degree to which they do this differs and conforms to language-specific grammatical patterns. It is argued that the effects of grammatical structure on categorisation preferences are finer-grained than earlier studies have assumed, thus providing a more precise account of the extent and nature of linguistic influence on cognition.

Keywords: linguistic relativity; language and thought; object classification; quantification.

Abstracto

Estudios anteriores sobre preferencias en cuanto a clasificación de objetos muestra que los parlantes de idiomas que carecen del plural morfológico, tales como el yucatec o el japonés ilustran una tendencia a emparejar objetos por su material en común, mientras que aquellos parlantes de idiomas que sí utilizan el plural morfológico como el inglés, muestran una tendencia a emparejar objetos por su forma común. El presente estudio compara las preferencias de categorización entre parlantes de inglés y japonés en comparación con el griego. El idioma griego se asemeja al inglés en el plural morfológico, aunque se diferencia en que los sustantivos en masa típicamente no resisten la pluralización. Los resultados demuestran que todos los grupos se distinguen significativamente entre los objetos cuantificables y los no-cuantificables, aunque el grado de diferenciación sigue un patrón específico de cada idioma y estilo gramatical. Es debatible por otra parte que los efectos de la estructura gramatical en cuanto a las preferencias de categorización son más detalladas de lo que se asumía en estudios anteriores, proveyendo de esta manera una explicación más precisa sobre la relación entre la lingüística y la cognición.

Palabras clave: *relatividad lingüística; lengua y pensamiento; clasificación de objeto; cuantificación.*

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Introduction

The question of whether the language we speak influences the way we think (Whorf, 1956) has been at the centre of multi-disciplinary theoretical debate in the fields of Linguistics, Psychology, Anthropology and Philosophy for the better part of the 20th century and beyond (Gentner & Goldin-Meadow, 2003; Gumperz & Levinson, 1996; Hunt & Agnoli, 1991). Due to advances in the field of cognitive science, it has been recently possible to investigate empirically the extent of linguistic influence on cognition. A number of recent studies (Imai 2000; Imai & Gentner 1997; Imai & Mazuka 2003; Lucy 1992; Lucy & Gaskins 2001) have suggested that there may be a link between the way a language quantifies nouns and the way speakers of that language perform in object classification tasks. One such task is the triads matching task. This task requires decisions to be made about the similarity between objects based on common shape or common material. Participants are presented with a standard entity (e.g., a cardboard box) and they are asked to decide if it is more similar to a shape alternate (e.g., a plastic box) or a material alternate (e.g., a piece of cardboard). Despite methodological differences, the majority of studies show the same pattern. Speakers of English tend to make a shape match significantly more than speakers of Japanese or Yucatec (a native Mexican language) when the standard entity is a countable object (e.g., a cardboard box). However, when the standard entity is a non-countable substance (e.g., hand-cream arranged into a reverse c shape) the differences between the speakers of English and the speakers of Yucatec / Japanese diminish (such that both groups tend to match the reverse

c shaped hand-cream with a pile of hand-cream rather than with a reverse c made out of plasticine).

The claim in Lucy (1992) and Lucy and Gaskins (2003) seems to be that in Yucatec / Japanese all common nouns that refer to inanimate entities are in a sense ‘mass’, and their referents are perceived as non-individuated entities. In these languages, nouns cannot take grammatical number marking and cannot be modified directly by numerals (e.g., from Japanese: **san ringo* ‘three apple’). Number is optionally expressed through the use of external unitizers, which are called classifiers, with numerals (e.g., *san ko no ringo* ≈ three piece of apple, ‘three apples’). In English, however, there is an important subdivision within the nominal domain. On the one hand English has mass nouns (*sugar, water*), which cannot take morphological plural marking and need unitizers in order to be quantified (*Three glasses of water please / *Pass me three water please*). On the other hand, English also has count nouns, which take obligatory plural marking and direct numeral quantification. Their referents are perceived as individuated entities, i.e., as units with a distinct shape and function.

Consequently, where the languages resemble one another (mass nouns), the cognitive differences are minimised. Where the languages diverge, (count nouns), the cognitive differences are maximised. The conclusion drawn by Lucy and Gaskins (2003) is that the linguistic representation of nominal structure in a speaker’s native language may have an effect on the speaker’s habitual attention to different types of entities, i.e., the results provide some evidence consistent with the idea that the way we think is influenced by the language we speak (Whorf, 1956).

On the other hand, Imai and Gentner (1997), Imai (2000), and Imai and Mazuka (2003) claim that the ontological distinction between countable and non-countable entities is universal. The role of language is limited, such that linguistic typology may

enhance or diminish this distinction according to how strictly or how systematically specific linguistic features mark individuation on nouns. The current paper implements a triads matching task in order to investigate whether speakers of typologically distinct languages, namely English, Greek, and Japanese, habitually attend to countable and non-countable entities in different ways. Greek resembles English in that it has morphological plural marking on count nouns, but contrasts with English in that mass nouns typically do not resist pluralisation, i.e., they can take morphological plural marking just like count nouns. Assuming that Lucy (1992) is correct to make a link between grammatical number and object classification preferences, the goal of this paper is to examine to what degree categorisation patterns follow universal ontology or language-specific structure. The paper is organised in the following way: Firstly theoretical assumptions concerning the mass / count distinction and plural marking are discussed, both in terms of the referential basis of count and mass nouns, and the realisation of the mass / count distinction cross-linguistically, focusing specifically on English, Greek, and Japanese. Then the object classification preferences of English, Greek, and Japanese speakers will be compared and results will be discussed in relation to the nature and extent of linguistic influence on object categorisation.

Lucy (1992) identifies two crucial features of nouns as relevant to nonverbal classification preferences: [\pm animate] and [\pm discrete]. He shows that there is an interaction between these two features and plural marking. According to Lucy (1992), nouns can instantiate three possible settings:

- a) [+animate] and therefore automatically [+discrete]. These are nouns in both English and Japanese / Yucatec that can take plural inflection because they are discrete by virtue of their animacy.

- b) [-animate, +discrete]. Nouns carrying these settings are the traditional English count nouns. They take obligatory plural inflection when quantified. Apparently, there are no nouns in Japanese or Yucatec with this setting since nouns in these languages do not take plural marking.
- c) [-animate, -discrete]. Nouns carrying these settings are the traditional English mass nouns and all [-animate] nouns in Japanese / Yucatec. These nouns do not take plural marking and in order to be countable they require unitization by means of a unitizer, which in the case of Japanese / Yucatec is the classifier. In this light, English mass nouns resemble all [-animate] nouns in Japanese / Yucatec; and this is the basis on which it is often assumed that nouns in classifier languages are in a sense ‘mass’ and lack the count / mass distinction.

Explicit in Lucy’s (1992) account is that nouns with the setting [+discrete] encode an inherent unit of individuation which nouns with a [-discrete] setting lack. According to Lucy (1992), the best perceptual indicator of this inherent unit of individuation is usually the shape of objects. Consequently, in a triads matching task English speakers preferentially match objects according to common shape significantly more than speakers of non-plural-marking classifier languages when the target entity corresponds to a [+discrete] noun. On the other hand, when the target entity corresponds to a [-discrete] noun differences between the language groups are minimized, i.e., there is a one-to-one mapping between language and cognition.

Gillon (1992) and Chierchia (1998a) have proposed different theoretical accounts of the inherent properties of nouns from that of Lucy (1992). Gillon (1992) proposed that while count nouns refer to individuals, mass nouns are unspecified with regards to whether they refer to individuals or not. Chierchia (1998a) adopts the view that count

nouns inherently refer to individuals, but extends the theory on the semantic basis of mass nouns, by positing that mass nouns refer to a set of individuals, i.e., they are ‘inherently plural’. Thus according to Chierchia (1998a), the denotation of count and mass nouns is essentially the same, the only difference being that “mass nouns come out of the lexicon with plurality already built in” (Chierchia, 1998a, p. 53). This hypothesis has direct consequences for the way nouns are pluralized. According to Chierchia’s (1998a, 1998b) account, mass nouns cannot take plural marking, not because they inherently refer to non-discrete entities (as assumed by Lucy, 1992), but because pluralization of individuated entities is already part of their core semantic properties. Chierchia’s (1998a) theory allows for cross-linguistic differences between plural marking and numeral classifier languages by suggesting that in the latter type of languages all nouns are mass-like and there is no grammatical count / mass distinction. Crucially, however, in contrast to Lucy (1992), Chierchia (1998b) assumes that these differences do not entail that speakers of different languages have distinct ‘world-views’. Rather the cross-linguistic differences reflect just slightly different ways of referring to the same denotations.

Problems abound for both theoretical positions. A problem for Lucy’s (1992) view is the very notion of ‘inherent’ individuation / non-individuation of nouns and the ontological status of their referents. There are many mass nouns denoting perfectly individuated singularities (e.g., *humankind*, *furniture*). These ‘object-mass’ nouns, as Barner and Snedeker (2005) have recently referred to them, are cognitively perceived as more similar to count nouns than substance-referring mass nouns (e.g., *water*, *sand*) by children and adult speakers of English (Barner & Snedeker, 2005). Thus, there is no one-to-one mapping between grammatical structure and the semantic denotations of nouns.

A problem for Chierchia's (1998a) view of inherent plurality of mass nouns is that it presupposes that there can be no language where mass nouns can pluralise. However, a language which systematically allows pluralisation of mass nouns, even when they refer to obvious non-discrete entities (e.g., *water, sand, mud, oil*) is Greek (Tsoulas, 2005). With regard to count nouns, Greek resembles English. Count nouns take obligatory plural marking and can be directly modified by a numeral when quantified. However, with regard to mass nouns, Greek differs from English in interesting ways. With regard to English object-mass nouns, most of these are count nouns in Greek (e.g., *epipla = furniture-s, kosmimata = jewelry-s*, etc.). Moreover, as the examples in (1) and (2) demonstrate, substance-mass nouns like *water* and *sand* can be pluralized in their typical mass uses (both examples from Tsoulas, 2005):

(1) Trehoun near apo to tavani

drip-3rd -pl waters from the ceiling

Water is dripping from the ceiling.

(2) Irthe katefthian apo tin amoudia mesa ke mas gemise amous

came-he straight from the beach inside and us filled sands

He came from the beach straight inside and he filled the place with sand.

Examples like the above are commonly used by Greek speakers instead of the singular, which is obligatory in the equivalent English sentences.¹ Despite their differences, however, Greek mass nouns resemble English mass nouns in many other important respects: firstly, numerals cannot directly precede mass nouns (e.g., **Dose mou tris amous = *give me three sands*) but instead require unitisers in order to be quantified (e.g., *Dose mou tris kouvades amo = give me three buckets of sand*). Secondly, mass noun pluralization in Greek is not completely general: there are some contexts in which use of the singular is clearly the preferred option (e.g., where quantifiers like 'some' are

used to modify the nouns). Nevertheless, the fact that Greek allows pluralization of mass nouns in order to refer to non-discrete masses is incompatible with Chierchia's (1998a, 1998b) view of plurality of individuals as part of the inherent properties of mass nouns.

A third problem for both theoretical accounts concerns the count/mass distinction (or rather lack of) in non-plural-marking classifier languages. Both Lucy's (1992) and Chierchia's (1998a, 1998b) accounts assume that in these languages all nouns are 'mass-like', i.e., their semantic basis, whether it denotes non-discreteness or inherent plurality, is the same as that of mass nouns in English. Consequently, such languages lack a count / mass distinction in their nominal systems. However, Cheng and Sybesma (1999) have claimed that nouns in classifier languages are also predisposed semantically to occur in count or mass syntactic contexts. Specifically, these different syntactic contexts refer to two different types of classifier, namely count classifiers and mass classifiers or massifiers. The division of classifiers along the lines that Cheng and Sybesma (1999) present is not new. Sanches (1977), Denny (1979), Croft (1994) and Downing (1996) have all made a distinction between massifiers and count (true) classifiers. Cheng and Sybesma (1999) claim that the distinction between massifiers and count classifiers is a manifestation of the count/mass distinction in numeral classifier languages (see Downing, 1996 for the specific case of Japanese).

It could be argued then that the cross-linguistic difference between English and Japanese is not that the former has and the latter lacks the count / mass distinction, but rather concerns how often, or how systematically it is applied in the grammatical system of each language. In English, the distinction is systematic and obligatory. On the other hand, in classifier languages nouns that refer to countable entities resemble nouns that refer to non-countable entities in most respects: there is no plural marking and nouns

cannot be directly modified by a numeral without a classifier. Furthermore, quantification of nouns is optional rather than obligatory.

Turning the discussion to Greek, it could also be argued that it differs from English in how often and how systematically it marks the boundaries between the count / mass distinction grammatically. It seems that Greek mass nouns, although they resemble in some respects their English counterparts, they also share some of the typical characteristics of count nouns. In this respect, Greek would appear to be similar to classifier languages like Japanese in that it distinguishes between count and mass nouns less systematically than English does.

Aims of the Current Study

Recent accounts of the relationship between grammatical structure and cognition have suggested that the ontological object / substance distinction is universal, and the cognitive differences and similarities between speakers of English and Japanese / Yucatec reflect the degree to which the distinction is systematized in the grammatical system of their language (Imai, 2000; Imai & Gentner, 1997; Imai & Mazuka, 2003). Contrary to Lucy (1992), this account argues for universal ontology, with linguistic structure affecting the boundary between the two ontological kinds.

The current study aims to investigate whether the degree to which speakers of different languages attend cognitively to the ontological distinction between objects and substances is relative to the degree to which this distinction is emphasized in the grammatical systems of their language. The behaviour of individuals from three typologically distinct language backgrounds, namely English, Greek, and Japanese, will be compared in a triads matching task. The study follows the methodology used in Lucy (1992), Lucy and Gaskins (2001, 2003), Imai and Gentner (1997), and Imai and Mazuka

(2003). Participants will be asked to match target entities corresponding to countable objects or non-countable substances with a shape or material alternate.

Method

Participants

The participants were 20 monolingual English-speaking adults (mean age 25, age-range 18-60, 11 female, 9 male), 20 monolingual Japanese-speaking adults (mean age 21, age-range 19-46, all female) and 20 monolingual Greek-speaking adults (mean age 22, age-range 19-26, 13 female, 7 male).² Each participant was tested individually in a quiet room. All participants were tested in educational institutions (i.e., University or private language institute) in their respective countries. Sociocultural factors were controlled in this experiment as most participants fell more or less within the same age-range (early twenties) and all of them were University students in the UK, Greece, or Japan.

Materials

The materials are summarized in table 1. There were two experimental conditions: a count condition, where the standard object was a solid entity that can be labelled in English as a count noun. Most of these included solid simple-shaped objects. And a mass condition where the standard object was a substance that can be labelled in English as a mass noun. Most of these included non-solid substances arranged into a simple shape.³

Table 1. List of materials arranged in triads.

| <i>Standard</i> | <i>Shape alternate</i> | <i>Material alternate</i> |
|------------------------|------------------------|---------------------------|
| <i>Count Condition</i> | | |
| 1. Plastic clip | Metal clip | Plastic pieces |

| | | |
|-----------------|--------------------|------------------|
| 2. Wooden spoon | Plastic spoon | Stick of wood |
| 3. Candle | Candle-shaped wood | Piece of wax |
| 4. Cork pyramid | Plastic pyramid | Chunk of cork |
| 5. Plastic UFO | Wooden UFO | Piece of plastic |
| 6. Wax kidney | Plaster kidney | Wax pieces |

Mass Condition

| | | |
|---------------------------------|------------------------------|----------------------|
| 1. Toothpaste arch | Plasticine arch | Pile of toothpaste |
| 2. Stick of chalk | Stick of wax | Pile of chalk |
| 3. Pepper upside down V | Toothpaste upside down V | Pile of pepper |
| 4. Sawdust upside down Ω | Leather upside down Ω | Two piles of sawdust |
| 5. Decoration sand reverse S | Glass reverse S | Three piles of sand |
| 6. Nivea cream reverse C | Plasticine reverse C | Nivea cream pile |

Procedure

There were six trials for each condition. Thus each participant received a total of twelve trials. In each trial, the participant was presented with a triad of a standard and two alternates, shape or material. All entities were presented on white paper plates and were covered with a piece of paper. During each trial, the standard was uncovered first, and participants were prompted to pay attention to it. Then the two alternates were simultaneously uncovered and the participants were prompted to point to the entity that is the ‘same’ as the standard. The language of instruction was always the participant’s native language (since all participants were monolingual). For the English speakers the instruction was “Show me which is the same as this”. For the Greek participants the instruction was “Deikse (show) mou (me) poio (which) einai (is) to (the) idio (same) me

(as) afto (this)”. For the Japanese participants the instruction was “Kore (this) to (with) onaji-nano (same) wa (topic-marker) docchi (which) desuka (is)” (cf. Imai & Mazuka 2003). Participants were instructed to make their decision at their own pace and according to their own opinion. The order in which the trials were presented was randomized for each participant.

Results

Responses were scored as the number of times each participant selected a shape or material alternate in each condition. Scores were then converted into percentages and the mean was calculated for each group of participants. In table 2 a summary of those mean scores is presented.

Table 2. Summary of mean proportion of shape and material preferences (and standard deviations) in each group. Figures are percentages rounded to the nearest whole number.

| Groups | Count condition | | Mass condition | |
|----------|-----------------|----------|----------------|----------|
| | Shape | Material | Shape | Material |
| English | 89 (17) | 11 | 47 (30) | 53 |
| Greek | 82 (25) | 18 | 62 (33) | 38 |
| Japanese | 54 (28) | 46 | 39 (20) | 61 |

To examine the overall pattern, a 3 (Language) x 2 (Condition) mixed ANOVA (with Language as a between-subjects factor and Condition as a within-subjects factor) was conducted. It is evident from table 2 that the proportion of material responding is 1

minus the proportion of shape responding, therefore for the statistical analysis the frequency of shape responses in each condition was the dependent variable (cf. Imai & Gentner 1997, p. 182, footnote 5, and p. 183).

There was a significant main effect of Condition, $F(1, 57) = 54.785$, $p < 0.01$, and a significant main effect of Language, $F(2, 57) = 7.681$, $p < 0.01$. Crucially, the Language x Condition interaction was significant, $F(2, 57) = 5.692$, $p < 0.01$. This indicates that the degree to which participants varied their shape responses across the two conditions differed amongst the three language groups.

Looking at the simple main effects, there was a significant effect of Condition for all groups, such that all groups selected shape significantly more in the count than in the mass condition, $F(1, 57) = 48.607$, $p < 0.05$ for the English group, $F(1, 57) = 11.587$, $p < 0.05$ for the Greek group, and $F(1, 57) = 5.974$, $p < 0.05$ for the Japanese group. There was also a significant effect of Language at both conditions, $F(2, 114) = 10.345$, $p < 0.01$ for the Count condition, and $F(2, 114) = 3.911$, $p < 0.05$ for the Mass condition. Tukey HSD pairwise comparisons were used to compare the means of the three groups for the two conditions. For the Count condition, these showed that the English and the Greek groups selected shape significantly more than the Japanese group ($p < 0.01$), while there was no difference between the English speakers and the Greek speakers ($p > 0.05$). For the mass condition, the pairwise comparisons showed that the Greek speakers selected shape significantly more than the Japanese speakers ($p < 0.05$), while the English speakers did not differ significantly from either group ($p > 0.05$).

These results clearly show that all groups distinguish between the different target entities, since they all select shape significantly more in the Count than in the Mass condition. However, the between-group differences suggest that the degree to which they do this differs across groups. Since the focus of the study concerns the degree to which

groups differed across the two conditions, a new dependent variable was created by subtracting shape scores in the mass condition from shape scores in the count condition. The greater the resulting score, the more distinction is made between countable objects and non-countable substances. The resulting scores were 42% for the English-speaking group, 20% for the Greek-speaking group, and 15% for the Japanese-speaking group. A One-Way ANOVA with Language as between-subjects factor and degree of differentiation as dependent variable showed a significant main effect of Language, $F(2, 57) = 5.692, p < 0.01$. Post-hoc Tukey tests showed that the English group differed significantly both from the Greek group ($p < 0.05$) and the Japanese group ($p < 0.01$), while there was no significant difference between the Greek and the Japanese groups ($p > 0.05$). This means that the English speakers distinguish significantly more between countable objects and non-countable substances than either of the other two language groups, which in turn show the same degree of differentiation across conditions.

Discussion

There is a growing body of evidence to suggest that speakers of different languages whose grammatical structure differs match stimuli in different ways. The current paper reported an experiment investigating the degree to which speakers of different languages attend to the mass / count distinction cognitively, by asking participants to match countable and non-countable target entities to a shape or material alternate. The results showed that English, Greek and Japanese native speakers distinguished significantly between the different entity types, by favouring the shape alternate significantly more when the target was a countable object than when the target was a non-countable substance. However, subsequent analyses showed that the degree to

which they did this varied and conformed to the degree to which each language distinguishes between countable and non-countable nouns in its grammatical system.

Two important related questions arise from the debate over the influence of grammatical structure on object classification. The first concerns the degree to which denotations of count and mass nouns follow strictly linguistic or universal ontological principles. The second concerns the degree to which language and cognition may converge. In response to the first question, the current study shows that the global patterns of categorisation are essentially language-independent. All three groups show preferential attention to shape when the standard is a countable object rather than a non-countable substance. Furthermore, the finding that Japanese speakers distinguish between objects and substances bears favourably on Cheng and Sybesma's (1999) proposal that the count / mass distinction can also be found in numeral classifier languages. This would suggest that the count / mass distinction may be found in one form or another across languages, implying that language maps onto pre-existing universal ontological distinctions.

In response to the second question however, it appears that linguistic structure and cognition are indeed tightly linked. The degree to which speakers of different languages attended to the countable / non-countable ontological distinction corresponded very closely to the degree to which the count / mass distinction is emphasised in the grammatical systems of their respective languages. As table 2 shows, the cognitive differences and similarities between English and Japanese monolinguals reflect the cross-linguistic differences and similarities and are in line with the results obtained from previous studies: in the count condition, differences are maximised, while in the mass condition the two groups perform similarly. This supports Lucy and Gaskins' (2003) claim that there is an interaction between the language type (English and Japanese /

Yucatec) and referent type (object or substance) in object categorisation preferences. In the case of the Greek speakers, it seems that the degree to which they attend to the object / substance distinction resembles more that of Japanese speakers than that of English speakers. This finding matches neatly the similarities between Greek and Japanese, in that both do not distinguish between count and mass nouns as frequently and as systematically as English does.

Taken together, the current findings and Lucy's (1992) previous findings do not support the view that the semantic basis of count nouns and mass nouns is essentially the same (Chierchia, 1998a), and that cross-linguistic differences do not entail differences in the world-view of speakers of different languages (Chierchia, 1998b). Instead, Lucy's (1992) basic insight is supported, namely that grammatical properties of specific languages correlate with the way speakers of these languages categorise objects. However, the way these grammatical properties draw speakers' attention to features of stimuli appears to be finer grained than has been assumed up to now. This finding supports Imai and Gentner's (1997), Imai's (2000) and Imai and Mazuka's (2003) claim that while the ontological distinction between objects and substances may be universal, specific linguistic structure modulates the degree to which that distinction is observed cognitively.

This view is also supported by findings from the developmental literature. Research shows that while children initially use universal ontological knowledge to categorise entities as objects or substances (Soja, Carey & Spelke, 1991), later on, after experience with language, categorisation patterns are influenced by the syntactic count/mass distinction (Subrahmanyam, Landau & Gelman, 1999) and become language-specific to a certain extent (Imai & Gentner, 1997; Lucy & Gaskins, 2001). Furthermore, recent studies show that acquisition of a second language with different grammatical

properties from the first may reorganise cognition according to the distinctions made in it (Athanasopoulos, 2006, 2007; Cook, Bassetti, Kasai, Sasaki and Takahashi, 2006).

The focus then need not be so much on whether the relationship between language and cognition is causal, but rather on the extent and precise nature of linguistic influence on pre-existing cognitive patterns. A similar argument has been made recently for colour cognition, a domain central to the language and thought debate. Kay and Regier (2006, 2007) and Regier, Kay and Khetarpal (2007) have shown that colour naming is determined by universal perceptual constraints, such that focal colours (i.e., colours near the center of a category) are linguistically and perceptually more salient than non-focal colours across cultures. On the other hand, there also exists considerable cross-linguistic variation at the demarcation of category boundaries, i.e., linguistic convention influences where speakers of different languages partition colour space. This view accommodates the existence of BOTH universal constraints on colour naming AND the influence of cross-linguistic differences on colour cognition (Kay & Regier, 2007).

In this light, the current findings may have interesting implications for the mechanism driving the effects of language on cognition. Specifically, it may not necessarily be a single linguistic property, e.g. the presence or absence of plural marking or a +/- discrete feature per se, which is directly responsible for how speakers categorise objects. In fact if that were the case then we would expect absolute patterns of categorization rather than the refined, finer grained patterns observed. Rather, it is a matter of how systematically the count/mass distinction is emphasized in the languages under investigation that determines how systematically speakers of these languages attend to the universal distinction between objects and substances. In this sense, language directs rather than forces our attention towards certain characteristics that are intrinsic to the object, such as its shape or material properties. Given the recent overwhelming

interest in the area of linguistic relativity, more empirical evidence is being gathered across domains and disciplines, and we are beginning to obtain a clearer understanding of the precise role that language plays in influencing our behaviour.

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Footnotes

¹ Note that these examples are different from exceptional cases of plural marking on mass nouns such as standard servings (e.g., *We ordered three beers and two red wines*), types (e.g., *they only serve two meats, chicken and beef*), and idiomatic expressions (e.g., *Mary's waters broke, the sands of time*), present in both English and Greek.

² Given that English is formally taught at school in both Japan and Greece, participants in these two groups were selected on the basis of them not attending English-related courses at University, not having visited an English-speaking country previously for more than two weeks, and not having any formal English language qualifications. Furthermore, they were required to complete a formal English proficiency test, namely the Quick Oxford Placement Test (QPT, 2001), upon completion of the object classification task. The test lasted for approximately 20 minutes and all of the participants' scores fell below the Intermediate level of the QPT.

³ Many of the objects have been used in previously published studies (e.g., Cook et al., 2006; Athanasopoulos, 2007). A third category of objects with complex structure (i.e., Imai and Gentner's, 1997, 'complex objects') was not included in this study because Imai and Gentner (1997) found no significant differences between English and Japanese speakers in this condition, suggesting that the complex shape configuration of objects may override any potential influence of linguistic structure on object classification preferences.

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