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Do bilinguals have different concepts? The case of shape and material in Japanese L2 users of English

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Abstract

An experiment investigated whether Japanese speakers' categorisation of objects and substances as shape or material is influenced by acquiring English, based on Imai and Gentner (1997). Subjects were presented with an item such as a cork pyramid and asked to choose between two other items that matched it for shape (plastic pyramid) or for material (piece of cork). The hypotheses were that for simple objects the number of shape-based categorisations would increase according to experience of English and that the preference for shape and material-based categorisations of Japanese speakers of English would differ from monolingual speakers of both languages. Subjects were 18 adult Japanese users of English who had lived in English-speaking countries between 6 months and 3 years (short-stay group), and 18 who had lived in English-speaking countries for 3 years or more (long-stay group). Both groups achieved above criterion on an English vocabulary test. Results were: both groups preferred material responses for simple objects and substances but not for complex objects, in line with Japanese monolinguals, but the long-stay group showed more shape preference than the short-stay group and also were less different from Americans. These effects of acquiring a second language on categorisation have implications for conceptual representation and methodology.

1 Introduction

Since at least Weinreich (1953), research into second language (L2) acquisition and bilingualism has concentrated on the relationship between the first language (L1) and the second language or languages in the mind of the same person but has paid little attention to the concepts present in the same mind. This paper opens up the discussion of whether the minds of people who speak two languages differ from monolinguals in concepts as well as language by reporting an experiment that investigated whether the concepts of Japanese speakers are influenced by acquiring English.

The starting point must be to show that speakers of different languages have different concepts. Recent years have seen a renewed interest in linguistic relativity, a regeneration of the Whorf-Sapir hypothesis. To take three examples relevant to the later discussion, people express locative deixis either relative to their own orientation or as absolute orientation (Levinson, 1996); speakers of Berinmo and English have different boundaries between colours (Davidoff, Davies & Roberson, 1999); those who speak languages that mark gender perceive inanimate objects as having characteristics typical of their grammatical gender (Boroditsky, Schmidt & Philips, 2003).

This is not to say that people have not argued strongly against such variation in concepts between cultures, for example the claim by Li and Gleitman (2002) that

Levinson's results were experimental artefacts, based inter alia on whether the experiment took place out of doors or indoors, refuted in Levinson, Kita, Haun & Rasch (2002). In the light of this recent wave of research, at least it cannot be taken for granted that language varies between people but concepts do not, even if it is unclear how important such differences may be. Knowing a particular language goes with knowing one set of concepts rather than another.

If this is indeed the case, it raises interesting questions about the minds of people who know more than one language. The possibilities might be:
i) *L2 concepts are not acquired.* The L2 user acquires the language, not the conceptual system, and effectively uses L1 concepts with the L2. For instance, the Italian *blu* corresponds to a darker shade than the English *blue*. An English-Italian bilingual might therefore talk about *blue* and *blu* and always refer to the (English) lighter shade.
ii) *the two sets of concepts exist in separate compartments.* The L2 user effectively thought-switches between the two concept-systems when appropriate. The English-Italian bilingual might think about a darker shade of blue when speaking Italian, and about a lighter shade when speaking English.
iii) *the two sets of concepts are integrated to some extent.* The L2 user has partially overlapping concept-systems. An English-Italian bilingual might think of an intermediate shade in between the English dark one and the Italian light one when speaking both languages.
iv) *a new conceptual system has been created.* The L2 user thinks neither in the same way as the native speaker of the first language nor in that of the native speaker of the second language but in a distinctive way that differs from both. An English-Italian bilingual might think of a new shade, perhaps closer to violet or to green, than any of the shades monolingual English and Italian speakers call *blue* or *blu*.

These four possibilities represent different points on the integrative continuum for relating the languages in the L2 user's mind (Cook, 2003) that have been substantiated for syntax, the lexicon and phonology. The novelty is applying the approach to the domain of concepts rather than language.

Inevitably the discussion of the relationship between language and cognition is bedevilled by pitfalls. One is the controversial separation between language and cognition. Chomsky for instance totally separates language from cognition, which consists of a set of innate universal concepts 'essentially available prior to experience' (Chomsky, 1991: 29). In this model the linguistic and conceptual systems are partitioned from each other and do not contribute to each other's development. Another difficulty is the relationship between the acquisition of concepts and their existence in the mind. Language and concept might be tied together in the child's development, as Piagetians have always claimed, but separated in language use (Sinclair-de-Zwart, 1967). The use of concepts once acquired has been clarified by the useful distinction made by Slobin (1987; 2003) between thinking and thinking for speaking.

One approach has then been to assume that, as far as possible, concepts should be studied in a 'pure' form; as Boroditsky et al. (2003, p.62) put it, "Does thinking for speaking a particular language have an effect on how people think when not thinking for speaking that language?" The aim is to minimise the language element so that concepts can be studied independently. However, it may be virtually impossible to eliminate language altogether since any experimental task is always set in a situational

context involving language and the instructions for carrying it out have to be conveyed through a particular language. Obviously, the very idea of linguistic relativity itself assumes a language/concept bond since, without some link between language and concepts, there would be no linguistic relativity in the first place.

A second thorny problem is defining a concept. According to Pavlenko (2002), concepts are 'mental representations which affect individuals' immediate perception, attention, and recall' and allow 'identification, comprehension, inferencing, and categorization' (p. 70). Much research has concerned 'grammaticalised' concepts, that is to say those concepts that are instantiated directly in the syntax of a language (Meillet, 1912; Campbell, 2001, 103). A much-used recent example is how concepts are grammaticalised into verbs of motion and preposition phrases. Some languages prefer to indicate the path and endpoint of the action as in the Spanish verbs 'entrar' (enter) or 'salir' (exit); other languages prefer to indicate the manner in which the motion takes place, as in the English verbs 'crawl' and 'run' (Malt, Sloman & Gennari, 2003). So do the speakers' concepts of motion differ, or just their language? Malt, Sloman & Gennari (2003) in fact show an effect only after naming has taken place, showing thinking for language is involved.

Another favourite category for research is gender, differing in whether or not it is grammaticalised. In languages like English it is expressed 'naturally', i.e. gender almost entirely follows sex and animacy and has little to do with the syntax. In languages like German it is 'arbitrary', i.e. inanimate objects can be male or female, making gender a grammaticalised category. The research of Boroditsky et al. (2003) seems to show effects of grammaticalised concepts on speakers' memories, mental imagery and word associations. These grammaticalised concepts contrast with lexicalised concepts such as colours where the conceptual difference between languages is reflected in vocabulary items rather than in grammatical structure.

A third difficulty is the link between language and culture. Is the linguistic difference between two languages due to the different cultural realities that their speakers inhabit? Culturally different concepts might be due to the habits of their speakers; the advanced ability of Malaysians to distinguish degrees of saltiness compared to English speakers and the large number of expressions for saltiness in Bahasa Malaysia (O'Mahoney & Muhiudeen, 1977) may reflect their cuisine not their language. Some concepts may differ between people because of culture, not language. The differences in susceptibility to visual illusions between cultures for example are ascribed by Segall et al. (1966) to differences between 'carpentered' and 'non-carpentered' environments, not to grammaticalised or lexicalised concepts.

The main question so far tackled by L2 research is concepts of colour, that is to say how colours are 'lexicalised', i.e. instantiated in words. Caskey-Sirmons and Hickson (1977) found that monolingual speakers of Korean use the colour term *paran sekj* (blue) to mean something greener and less purple than Koreans who know English. Athanasopoulos (2001) showed that Greeks who knew English had a different perception of the colour 'blue' than Greeks who did not. In both these cases, the second language colour concepts are affecting their first language, in other words support for alternatives (iii) or (iv) above in which the two languages have affected each other.

The current research aims to test these possibilities further by investigating conceptual differences between monolingual and bilingual speakers: has the acquisition

of a second language affected the concepts of the L2 user? The approach is to take an established research paradigm that demonstrates conceptual differences and to apply it to bilinguals to see whether or not they think differently from their monolingual peers. The method, following Lucy (1992b) and Soja, Carey and Spelke (1991), is a fixed-choice triad test. Subjects are presented with a target item such as a cork pyramid, as in Figure 1, and are asked to choose which of two other items are most like it; one has the same shape (say, a plastic pyramid), the other is made of the same substance (say, a piece of cork). Their choice will thus show whether they are categorising the original object/substance in terms of shape or material. A pyramid is similar to another pyramid because they have the same shape, regardless of whether they are made of wood or plastic. Something made of cork is similar to a piece of cork because they are made of the same material, regardless of the shape or amount.

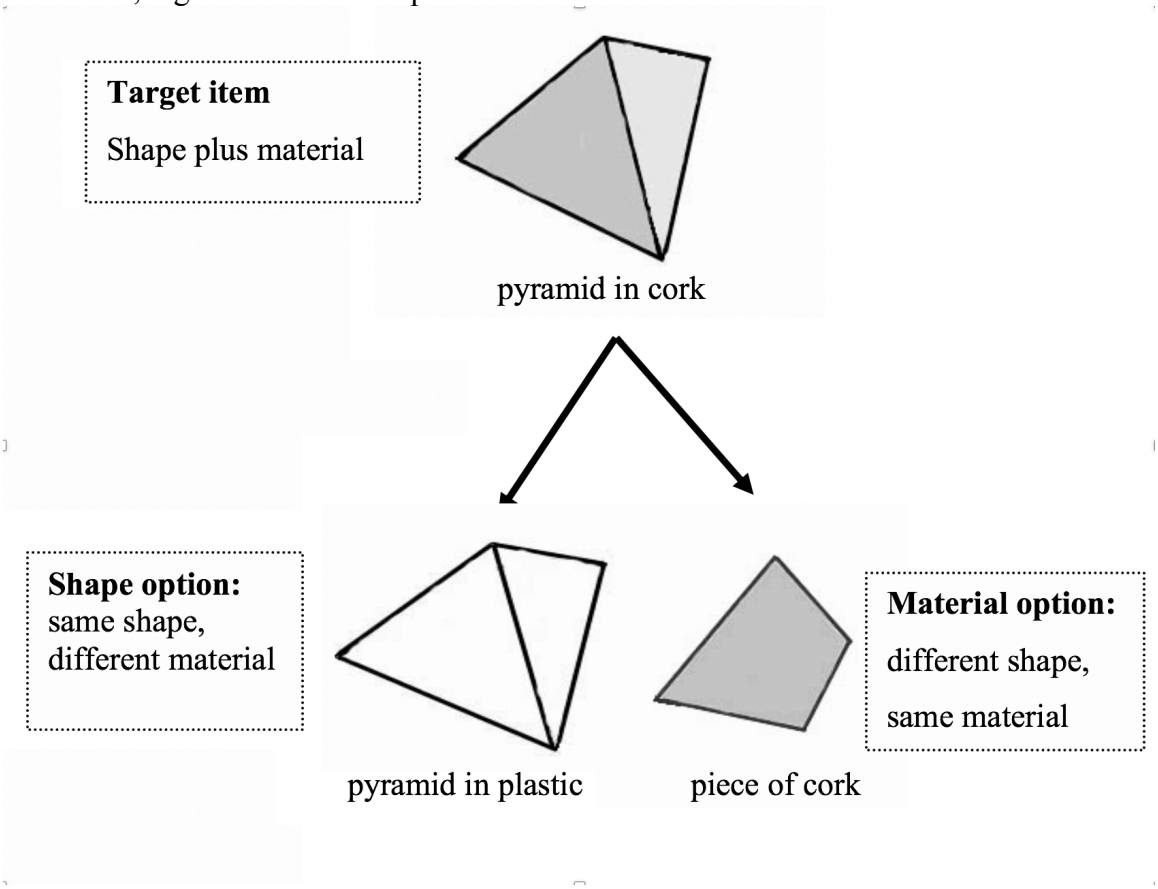

Figure 1. A triad of items used in the experiment

Using this methodology, Imai and Gentner (1997) found that adult monolingual Japanese speakers tended to categorise items according to their material, that is to say choosing the piece of cork rather than the cork pyramid, while adult monolingual English speakers tended to categorise them according to their shape, i.e. choosing the pyramid rather than the piece of cork.

In Imai and Gentner's experiment, there were no differences between English-speaking Americans and Japanese speakers for complex objects (i.e. objects with a function that is reflected in their shape) such as a wooden whisk, where both groups

preferred a shape response. But there was a difference for simple objects, i.e. objects with a simple shape but no clear function, which were categorised as shapes (i.e. seen as objects) by the English speakers, and categorised as material (i.e. seen as substances) by the Japanese speakers. Differences also appeared in the classification of substances. For instance sand in an S-shape was sometimes classified on the basis of shape by the English speakers: the presence of a simple shape led them to categorise substances by shape, thus choosing glass beads in an S-shape rather than three piles of sand to go with sand in an S-shape.

Imai and Gentner (1997) and Imai (2000) explain the difference between the two groups in terms of syntactic differences between the English and Japanese languages. In English mass nouns such as 'water' and 'clay' cannot be directly modified by numerals – **a water* and **twenty clays* are virtually impossible – but have to be quantified through particular classifiers – *a glass of water* and *a ball of clay;* count nouns such as *book* and *day* have no such restriction – *a book, twenty days.* Japanese does not normally express quantity (*koko ni hon ga aru*, 'here is book', *koko ni mizu ga aru*, 'here is water'); when quantity is expressed, all nouns behave like mass nouns with the noun preceded by the numeral and a classifier (*koko ni issatsu no hon ga aru*, literally 'here is one-classifier book'; *koko ni ippai no mizu ga aru*, 'here is one-classifier water'). Hence one explanation for the Japanese material preference found by Imai and Gentner (1997) is that the Japanese speakers fall back on material responses as a default in the absence of a syntactic distinction between mass and count nouns, whereas the English speakers have to constantly decide whether something is an object or a substance in order to apply the correct mass/count noun distinction, so that, whenever something has a shape, albeit extremely simple, it is classified by the English people as a count noun, i.e. an object. In one sense, this explanation conforms to the notion of grammaticalised concepts as it relates a conceptual difference to a syntactic difference. However, it is at best an indirect grammaticalised concept since the explanation does not concern how the concepts of shape and material are directly encoded in syntax but how the article system functions, something of much greater complexity and possibly more to do with specificity than mass and count (Bickerton, 1981).

2. Research Design

The research to be reported here replicated the Imai and Gentner (1997) design to see how Japanese who speak English as a second language categorise objects and substances. The overall question is whether people who know two languages have different concepts from monolinguals, more specifically whether Japanese speakers who know English categorise by shape and material in the same way as Japanese who do not know English. If these L2 users show different tendencies in categorising as shape or material, their concepts have been affected by the second language. The overall hypothesis is that there will be a difference in the categorisation by Japanese L1 speakers who do or do not know English. The actual research hypotheses are then:

- the number of shape-based categorisations of simple objects will increase in Japanese speakers according to their experience of English.
- the preference for shape and material-based categorisations of Japanese speakers of English will differ from monolingual speakers of both English and Japanese.

2.1 Subjects

An overall group of 36 Japanese L2 users of English was later divided into two groups with 18 subjects each: a short-stay group who had lived in an English-speaking country for at least six months and up to 2 years 11 months; and a long-stay group had lived in an English-speaking country for 3 to 8 years. The subjects were either university students or students in English language institutions, living in London or Essex and had similar economic backgrounds. The average age was 29, ranging from 22 to 42, 11 men, 25 women. Their proficiency in English was checked with a test based on Nation (1990), henceforward the Nation Test, which measures vocabulary at five levels, ranging from the most frequent 2,000 words up to the 10,000 word level. In order to qualify for the experiment, subjects were required to score above 60/90, i.e. more or less above about the 5000 word level.

One of the problems in this area is the definition of 'monolingual' and 'bilingual'. On the one hand pure monolinguals are nowadays hard to find. In Japan for example it is compulsory for all children to take English in secondary school; all Japanese below a certain age have at least been exposed to English in the classroom. It may be that the effects of learning a second language on the bilingual occur above a certain threshold; however, Yelland, Pollard and Mercuri (1993) showed that an hour a week of Italian improved the English reading of English-speaking children. On the other hand it is just as difficult to find people who are classic balanced bilinguals, equally proficient in all aspects of language; indeed it would be invidious to base the study of second language acquisition on such a minority of specially talented people. Hence we will prefer whenever possible to use the term 'L2 user' for people who know and use second languages, irrespective of how advanced they may be.

2.2 Materials

The materials used in this experiment were replications of those used in Imai and Gentner (1997), chosen for their cultural neutrality. Following Imai and Gentner (1997), we will use 'object' versus 'substance' as the names of categories, 'shape' versus 'material' as the names of responses. The word 'item' will refer to the individual examples of objects and substances in the experiment. The items in the experiment fell into three types, namely:

- *complex objects*, i.e. factory-made artefacts having complex shapes and specific functions (for example, a ceramic lemon squeezer).
- *simple objects*, i.e. simple shapes made out of a solid material (for example, a pyramid made out of cork).
- *substances*, i.e. non-solid materials arranged in a simple shape (for example Nivea cream laid in a reverse C shape Ↄ).

The test then separated the two ways of categorising by having a choice of shape or material response for each target item that was presented. The target ceramic lemon squeezer was then followed by a two-way choice between a wooden lemon squeezer (same shape as the target) and some pieces of broken ceramics (same material as the target) and the target Nivea cream in a reverse-C shape was followed by the two choices of a reverse C shape in hair-gel (same shape) and a pile of Nivea (same material).

Each of the three groups of complex objects, simple objects and substances had

four sets of items, so that each subject encountered 12 triads in all. Each object or substance was given a nonsense name; the lemon squeezer was, for example, named 'ejulem'. Table 1 lists all the items in the three groups with their nonsense names. The items were based as closely as possible on those used in Imai and Gentner (1997) apart from some minor changes due to the unavailability of materials such as Dylite and Super Sculpy in the UK. They were presented on paper plates around a horseshoe of tables, being concealed by paper towels until needed. The nonsense names for each item were checked for ease of pronunciation in both English and Japanese and for being nonsense words in both languages.

Type	Target Items		Test Items	
	Shape plus material	**Label**	**Same shapes**	**Same material**
Complex object	ceramic lemon squeezer	Ejulem	wooden lemon squeezer	ceramic pieces
	copper T junction	Evetty	plastic T junction	copper pieces
	red plastic clip	Tapy	metal clip	red plastic pieces
	wooden whisk	Luften	plastic whisk	pieces of wood
Simple object	cork pyramid	Nehear	plastic pyramid	cork piece
	plastic flying saucer shape (UFO)	Aniam	wooden flying saucer shape	pieces of plastic
	red play-dough half egg	Mukol	plastic half egg	red play-dough pieces
	orange wax kidney shape	Kelase	purple plaster kidney shape	orange wax pieces
Substance	reverse C-shape in Nivea cream (white)	Onlar	reverse C in transparent hair-gel	pile of Nivea
	foam capital gamma shape Γ	Muhaba	clay gamma shape	pile of foam
	sawdust capital omega shape Ω	Kelede	leather omega shape	two piles of sawdust
	sand S-shape	Storal	glass beads in S-shape	three piles of sand

Table 1. The materials used in the experiment

2.4 Procedure

The subjects first filled out personal particulars and took the Nation Test, taking about 15 minutes. All the subjects were then tested individually with one experimenter conducting the experiment while another recorded their answers. The subjects were told that it was a word learning test. First they would be given the name of an item and

then they would have to choose which of two other items they think would have the same name. Thus, each trial used a triad of items: one target item and two test items. For example, the experimenter showed them the ceramic lemon squeezer and announced in Japanese "kore wa ejulem to iimasu" (This is called ejulem). After uncovering the other two items on plates (in this case, the wooden lemon squeezer and the ceramic pieces), the instructor asked the subjects "dochira no osara ni ejulem ga notte imasuka" (Which of these plates also contains ejulem?). Some subjects received instructions in Japanese from a Japanese researcher and others received instructions in English from an English-speaking researcher.

3. Results

The overall results from all subjects are presented in Figure 2 in terms of the percentage of shape or material responses to each of the three types of item.

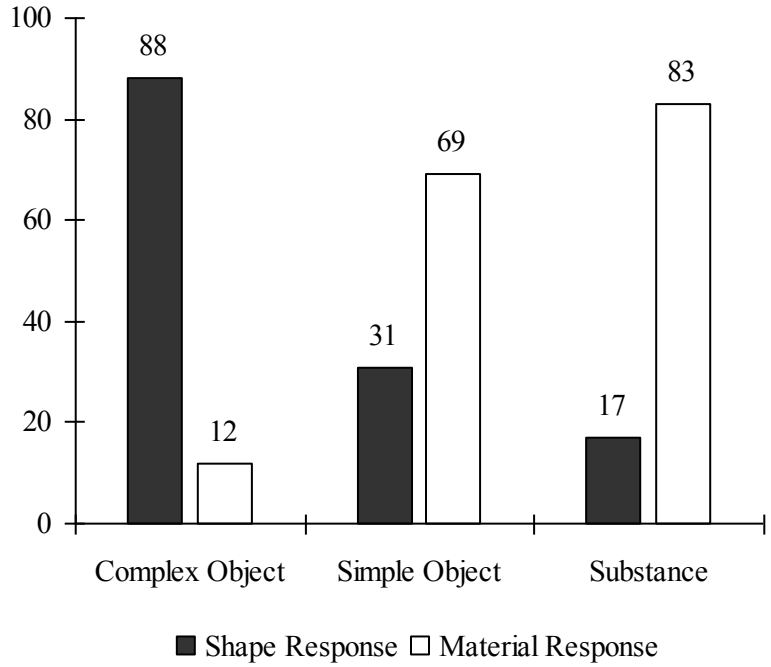

Figure 2. Overall Results: shape versus material responses (percentages)

The complex object items such as the lemon squeezer produced 88% shape responses, the simple objects such as the egg 69% material responses, and the substances such as the blob of Nivea cream over 80% material responses. While the responses for the complex objects were heavily shape-biased, those for both the simple objects and the substances were material-biased, particularly for the substances. Binomial tests (probability against 50-50 proportion) showed that the subjects as a whole had significantly stronger bias towards either shape or material for ten objects (they all scored $p < .005$, 2-tailed exact significance) but not for two simple objects, Pyramid (64% shape response) and UFO (56% material response) (2-tailed exact significance, $p = .13$ and $p = .62$ respectively). Overall the subjects confirmed to the expectation from Imai and Gentner's (1997) report that Japanese speakers would prefer

material responses for simple objects and substances but not for complex objects.

Each subject's response preferences for each type of items were classified as shape preference, material preference or no preference. A shape preference was attributed to subjects who made a shape choice three or four times out of four, a material preference to subjects who made a material choice three or four times, and no preference to subjects who made two material and two shape choices. Results are shown in Table 2 below.

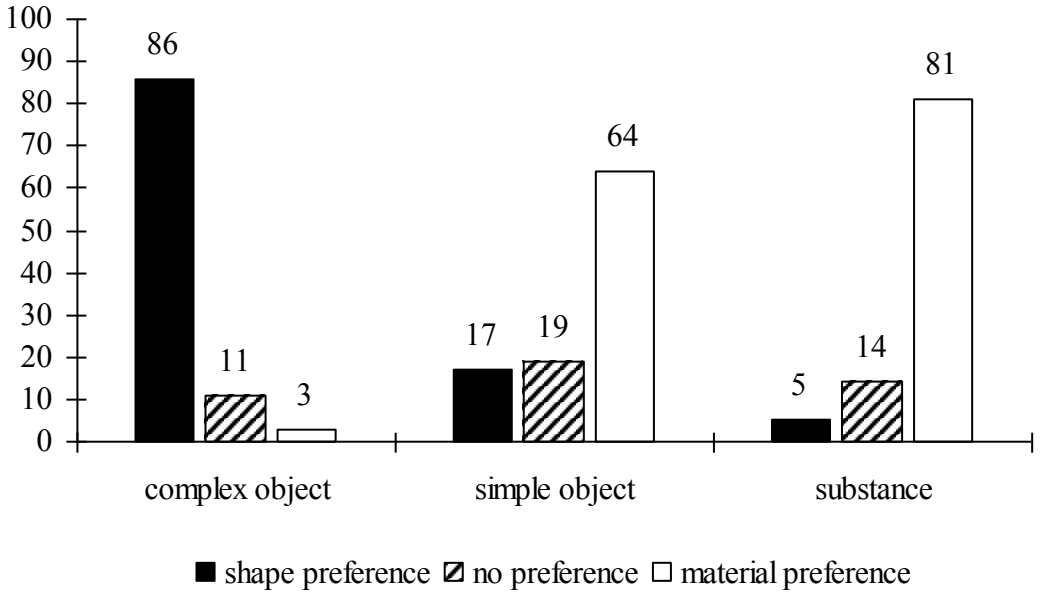

Figure 3. Individuals' preferences in terms of shape versus material (percentages)

Figure 3 shows an 86% shape preference for the complex objects, 64% material preference for the simple objects and 81% material preference for the substances. Binomial tests against the natural proportion (31.25%) revealed that the subjects' preferences for shape and material were highly significant for both groups; they all scored $p < .001$ (1-tailed exact significance). These results are then in line with the results in Imai and Gentner (1997) for Japanese monolinguals and underlines the crucial difference between complex objects (shape preference) and simple objects (material preference).

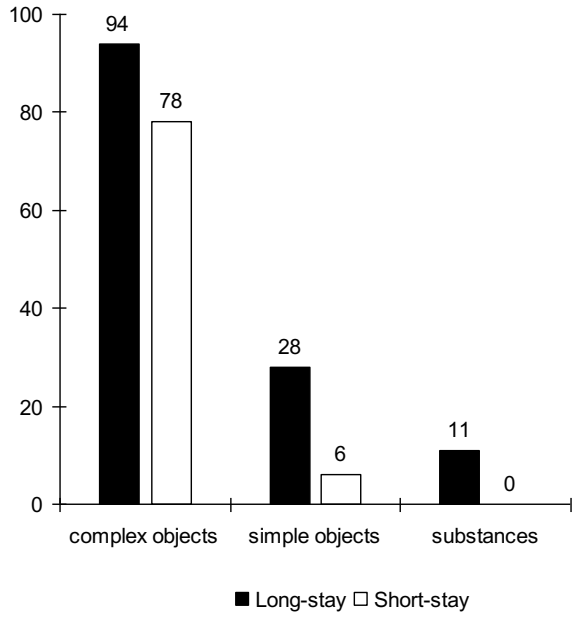

Figure 4. Shape preferences of long-stay (more than 3 years) and short-stay (less than 3 years) groups (percentages)

The presentation of the results so far has treated the group as a whole. By analysing the results in terms of duration of stay, it emerged that there were two groups, a long stay group with more than three years in an English-speaking country and a short stay group with more than 6 months but less than three years. The long-stay group clearly showed more shape preferences than the short-stay group, 94% versus 78% for complex objects, 28% versus 6% for simple objects, and 11% versus 0% for substances respectively (see Figure 4 above). For the shape and material preferences of the two groups (see Table 2 below), binomial tests against the natural proportion (31.25%) were conducted. Both shape preferences for complex objects and material preferences for substances were statistically significant for both groups; all of them scored $p < .001$ (1-tailed exact significance).

Preference	**Complex objects**		**Simple objects**		**Substances**	
	Long-stay	Short-stay	Long-stay	Short-stay	Long-stay	Short-stay
Shape	94	78	28	6	11	0
Non-pref.	0	22	16	22	11	17
Material	6	0	56	72	78	83

Table 2. Classification preferences of long-stay and short-stay bilinguals (percentages)

There were no statistically significant differences (Kolmogorov-Smirnov test, 2-sided exact significance) between the two groups (complex objects, p = .338; simple objects, p = .276; and substances, p = .658). In addition, an analysis of the results for the Nation test showed no correlation between language proficiency and preferences.

Results from the two bilingual groups were also compared with those from English and Japanese monolinguals reported in Imai and Gentner (1997). Obviously, this comparison is suggestive rather than conclusive since the materials and subjects may have differed in various ways but it is still worth carrying out since the present research is inspired by theirs. The comparison revealed that, while both groups of Japanese users of L2 English showed the same preferences as the Japanese monolinguals, the classification preferences of the long-stay bilingual group did not differ significantly from the English monolinguals for substances, and it differed from the English monolinguals much less than the short-stay bilingual group for simple objects.

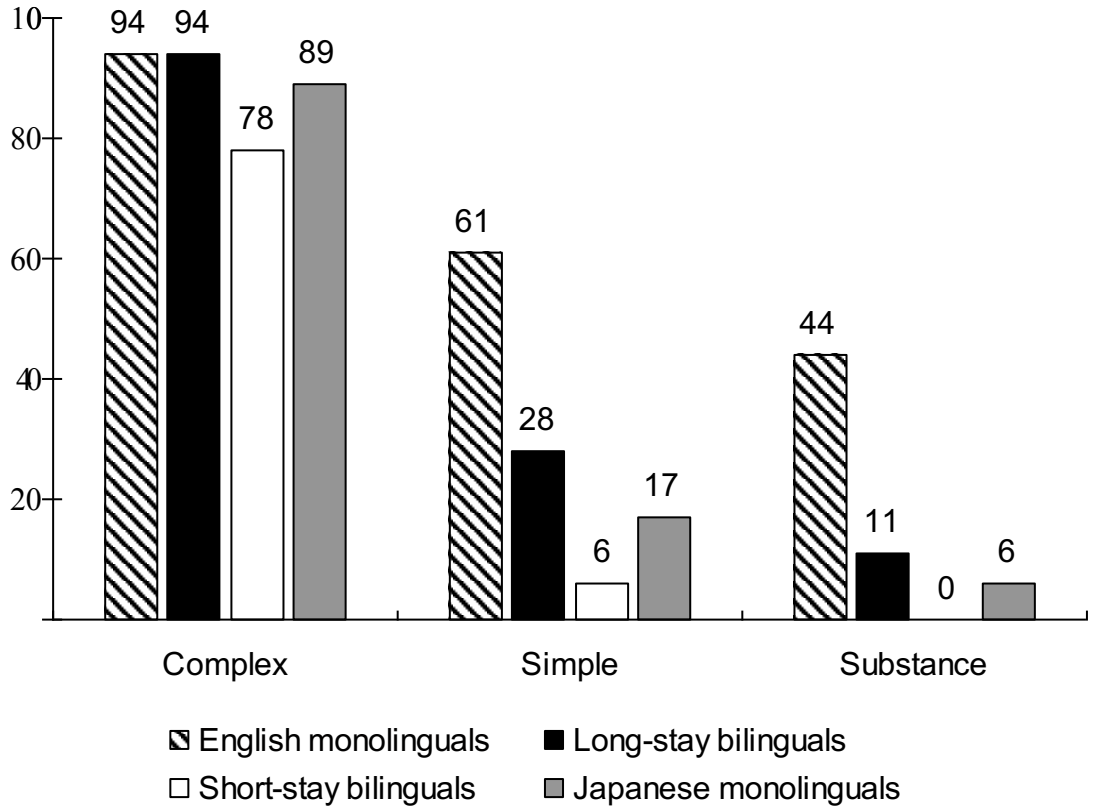

Figure 5. Shape preferences of bilingual and monolingual (I&G) subjects compared with long-stay and short-stay bilinguals (percentages)

Preference	Complex objects				Simple objects				Substances			
	EN	LS	SS	JP	EN	LS	SS	JP	EN	LS	SS	JP
Shape	94	94	78	89	61	28	6	17	44	11	0	6
Non-pref.	0	6	22	11	28	16	22	22	11	11	17	6
Material	6	0	0	0	11	56	72	61	44	78	83	88

EN = American English monolinguals (I & G), JP = Japanese monolinguals (I & G), LS = Long-Stay bilinguals, and SS = Short-Stay bilinguals.

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Table 3. Classification preferences of English and Japanese monolinguals and long-stay (LS) and short-stay (SS) bilinguals (percentages)

Figure 5 and Table 3 compare the classification preferences of the long-stay and short-stay Japanese L2 users of English with the preferences of the English and Japanese monolinguals in Imai and Gentner (1997).

Kolmogorov-Smirnov test (2-sided exact significance) were conducted to compare the groups of Imai and Gentner's monolingual Japanese and American English monolinguals with the present study's short- and long-stay bilinguals (cf. Table 3). There is no significant difference in preferences among all those groups for the complex objects and also no statistically significant differences between the monolingual Japanese and the two bilingual groups in any item types. The long-stay group show significant difference only for the simple objects ($p = .026$) compared with the American group but not for the substances ($p = .113$) while the short-stay and the monolingual Japanese groups show for both item types. As for the two groups (short-stay and monolingual Japanese), the significance levels for simple objects and substances against the American group are as follows: short-stay group ($p < .001$ & $p = .007$) and Japanese monolinguals ($p = .006$ & $p = .012$) respectively.

4. Discussion

The results of the present experiment show some effects of acquiring a second language on categorisation in Japanese L2 users of English with longer stays in the L2-speaking country. Such L2 users categorise simple objects and substances in ways that differ from those of monolinguals in either language.

As a whole, the Japanese-English L2 user group showed higher shape responses in the classification of complex objects than monolinguals, and higher material responses in the classification of simple objects. This confirms the findings of Imai and Gentner (1997) with regards to monolingual Japanese.

Complex objects are construed as objects because of their shape, which, in the items tested here, always reflects their function. They are categorised by shape by monolingual English speakers, monolingual Japanese speakers and Japanese-English L2 users alike. Complex objects seem to belong to the category of objects regardless of whether or not the speaker's language has a count/mass contrast, at least so far as the

two languages tested are concerned. This confirms previous findings from developmental psychology which show a shape preference for complex objects in children as young as two and from different linguistic backgrounds (Imai and Gentner, 1997).

Simple objects, whose status falls between that of complex objects and that of substances, are construed differently by speakers of different languages. English monolinguals show a shape preference, although not as strongly as with complex objects. Japanese monolinguals mainly have a material preference. Japanese L2 users increasingly prefer shape the longer they stay in an English-speaking environment; they end up effectively in between the monolingual speakers of both languages, that is to say possibility (iii) above, in which the two sets of concepts are to some extent integrated.

Substances should be universally construed as materials, regardless of language. However, English monolinguals construed substances as objects in about 50% of cases (Imai & Gentner, 1997), because substances were presented with a distinct shape. The presence of a shape, together with solidity, is enough for English speakers to perceive a lump of substance as an object. Japanese monolinguals mostly perceive substances as non-individuated, regardless of their shape. Japanese-English bilinguals do not change their material preference significantly with exposure to English (though there are small non-significant changes in the English direction); after more than three years of stay in an English-speaking country, they still have 89% material preferences.

The present findings from Japanese-English L2 users confirm the results of Imai and Gentner (1997) and Lucy (1992a) that speakers of different languages categorise differently where complex objects are not involved. It is hard to claim definitively that this is caused by a difference between the two languages. The Whorf-Sapir hypothesis resembles a chicken-and-egg problem; does a pre-existing concept create the linguistic device to represent it, or the linguistic device create the concept in the speaker's mind? Still, converging evidence points to an effect of language on classification of simple objects. Cross-linguistic developmental research shows that the material preference for simple objects in Japanese children increases with age, starting with no preference at age 2 and increasing to a strong material preference, while English children increase their shape preference (Imai and Gentner, 1997; Imai, 2000). In addition a computer simulation that trained the model with only lexical input failed to replicate Imai and Gentner's findings with simple objects, but when the connectionist model was trained with count/mass syntactic information, its performance approximated that of Japanese children (Colunga and Smith, 2000). This converging evidence seems to indicate the mass/count distinction is the source of differences in the classification of simple objects. To show that the link between the conceptual differences and the article systems of English and Japanese is more than a correlation would involve, say, testing the relationship between the syntax of articles and the concepts of shape and material in development.

The major interest in the present study is the comparison of the long-stay group with more than three years in the target-language country with the two monolingual groups; this long-stay group behaves in a way that situates them in between the two groups of monolingual speakers. This can be explained as the restructuring of the bilingual's mind consequent on acquiring a second language. The present study therefore provides evidence in support of the multi-competence hypothesis (Cook,

2002) by showing that the Japanese-English L2 users' knowledge is restructured as a consequence of acquiring a second language, leading to an integrated system where elements from both languages are combined.

The present research focussed on fairly advanced L2 users, with high proficiency levels (a score of 60 or more on the Nation test) and a minimum of 6 months exposure to the second language in a country where it is spoken. These requirements are necessarily arbitrary. Even minimal amounts of exposure to a second language may affect categorisation; such effects did not manifest themselves, however, in the group with shorter L2 exposure with the paradigm adopted here. The restructuring of categories may rely on increasing exposure to the target language, or there may be a threshold above which the second language starts to have an effect.

The importance of exposure to the L2 language environment, as opposed to proficiency *per se*, can be explained in different ways. Categories may change as a consequence of exposure to the English-speaking sociocultural *milieu*, so that it is not the language itself that causes these changes so much as the culture that goes with it. It is not clear, though, what aspect of the L2 culture could cause such restructuring.

The methodology of the present experiment fruitfully adopted the methods and findings of crosslinguistic psychological research to bilinguals. Yet, research on bilinguals has to take into account additional variables compared with crosslinguistic research on monolinguals by measuring or controlling the characteristics of bilinguals. In the present research, second language proficiency and exposure to the second language environment were controlled and measured, unlike say Mazuka and Friedman (2000) who assumed that any Japanese native speaker living in the US could qualify as 'bilingual' for the purpose of that experiment. Studies that do not take such variables into account are difficult to interpret.

Another important element in bilingualism research is that differences between monolinguals and bilinguals can be subtler and more difficult to quantify than those between groups of monolinguals. Sometimes, what matters is not what bilinguals do, but how they do it. For instance, in lexical judgment tasks bilinguals may give the same answer as monolinguals, but they may be slower (probably because they have to search a bigger lexicon than monolinguals, see Cook, 1997). The present research analysed bilinguals' answers, but in the course of the study it appeared that some bilinguals took a long time to perform the task and found it difficult. If this is so, future research could look at decision times, as well as the actual responses.

This paper then takes the first steps towards seeing whether L2 users differ in concepts as well as in language, by taking the case of Japanese users of English. If it is indeed true that L2 users 'think' differently from monolinguals, this will not only have consequences for models of L2 users, for example those that rely on Levelt (1989) or Levelt, Roelofs and Meyer (1999) with their separate language independent cognitive component, but will also add a new dimension to how the relationship between language and cognition is conceived.

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