Introduction

The universality of conceptual structures is an area that has been widely studies by scholars from different fields ranging from psychology to linguistics. Studies have shown that while these structures are likely to be universal across cultures and languages, the boundaries of the categories are influenced by language and culture (Imai and Gentner, 1997; Saalbach and Imai, 2007). One very important conceptual structure found to be affected by language is individuation, influencing the cognitive process of categorization.

Individuation is a very important concept used to classify an entity as an object or a substance. The label 'object' is used on entities that can be viewed as an individual unit in its entirety, where the name for it is applied to the entire entity, not referring to a part of it or the material it is made of. For example, a cup is an object. When we talk about a cup, there are certain mental images being formed. Regardless of its properties like handles and the material it s made of, it will still be recognized as a cup. Entities like tables, whisks and animals are considered as objects. 'Substance' on the other hand, is used to refer to entities that cannot be individuated. In other words, they cannot be separated or counted like objects. There is also no notion of the whole, shape or entirety when references are made to substances. In addition, they are usually classified and referred to by what it is made of and/or used with a measure quantity such as a glass of water, a pile of sand and a ball of clay. Other examples of substances include rice and foam.

With the understanding of the concept of individuation, it is important to understand how and where different languages draw the distinction between the object and the substance. This in turn reveals how conceptual structures of the speaker are affected by the languages they know.

Individuation in English and Chinese

In English, count nouns are used with objects (i.e. syntactically individuated) while mass nouns (i.e. syntactically unindividuated) are used for substances or a collective group of objects (like furniture as a collective term for three tables and three chairs, where table and chair are considered count nouns). The distinction between mass and count nouns is commonly referred to as the mass/count noun distinction and is governed by several grammar rules like number-verb agreement and the use of quantifiers (Table 1).

	English	Chinese
Sentence Structure	SVO	SVO
Noun Phrase	Det N	Num-CL-N
Classification of Nouns	Mass/count noun distinction	Use of Classifiers (which is also used to show individuation)
Number Marking	Use of plural form of noun to distinguish the singular and plural number for count nouns. This is usually done so by adding the suffix – (e)s. Number is also marked on determiners, such as this/these and through the use of lexical quantifiers. Mass nouns however require the use of a unitizer for it to be quantified	Grammatical marking of number on noun not present in the language. Number marking is optional and when necessary, numerals and numeral classifiers are used.
Number-Verb agreement	The suffix –s is added to the verb for singular nouns while the root verb is used with plurals e.g. He sings, They sing	Not present
Quantifiers	Different set of quantifiers used for mass and count nouns e.g. many/much, few/less	Same quantifier can be used for all nouns. For example, 很多书 'very many books', 很多水 'very much water'

Table 1 – Differences in Linguistic Features between English and Chinese

As such, speakers of the two languages respectively may categorize things differently arising from inherent differences in how each language is structured, specifically with reference to the grammaticalization of number as contrasted in Table 1.

Differences in thought arising from the presence of a classifier category in language have been widely investigated by many researchers and have gone to show support for the Saphir-

Whorf Hypothesis, providing evidence on how the structure of a language affects the way speakers conceptualize their world. This effect of the classifier category is commonly known as the classifier effect and has been found to influence individuals cognitively, especially when categorization is involved. The classifier category is of particular interest to be studied as the classifier system can categorize nouns into many different categories on the basis of its semantic features such as shape, material and size which is not possible in Western non-classifier languages that only carries count/mass grammar distinction (Saalbach and Imai, 2007). The classifier that a noun can take on is also very specific. Usually, most nouns can only be associated with one specific classifier. In rare or novel noun cases, two different classifiers may be used. The classifier '条 tiao' is used to distinguish objects that are long and bendable like 一条蛇 'a snake', 一条线 'a string', 一条绳子 'a rope'. Cases like 一条雨伞 'an umbrella' or 一条桌子 ' a table' would be unacceptable as the objects do not have the semantic features required by the classifier '条 tiao' . Consequently, understanding how classifiers affect categorization is important as categorization has been found to influence inference, choice and memory (Schmitt, 1998). This is in addition to the specificity of the classifiers in categorizing objects as demonstrated.

Lucy's study (1992) on grammatical categories and cognition proposed in her study that speakers of classifier languages tend to focus more on substance (define substance and material) than object, giving rise to a general material bias in similarity judgment tasks. This has also been investigated by other researchers like Imai and Henrik who forwards the argument that the classifier effect is observable across all classifier languages. When Imai (2000) adopted the study by Lucy and Guskins (2001) on Yucatec Mayan to Japanese, the Japanese monolinguals shared a similar performance profile in the tasks as the speakers of Yucatec Mayan, indicating a classifier effect on categorization. It is of interest in this study to investigate if differences in the properties and characteristics of a classifier system differ such as Chinese and Japanese will lead to differentials in categorization.

Cognitive Categorization in Monolinguals

In Imai (2000), she examined the conceptual distinction between shape and object in both children and adults who were Japanese and English monolinguals. The subjects were required to perform a non-word classification task where they had to select between a shape and material alternative (what the entity was made of) which they consider to be the same as the standard entity. They were given the instruction "Show me what the same as this (test object)."

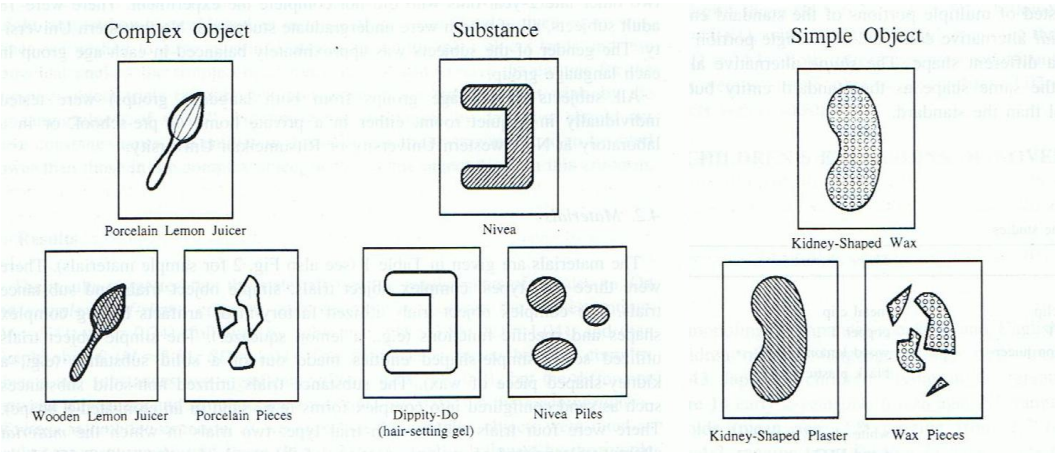


Figure 1 – Pictures of Sample Stimuli Set [extracted from Imai and Gentner (1997)]

There were a total of three item categories from which the ambiguous item was drawn from – complex object, simple object and substances. Complex objects are functional, manufactured and the function they serve is shown by their shape. For example, a lemon juicer is pointed and rounded to squeeze lemons (leftmost of Figure 1). Next, simple objects are entities that take on a simple shape with no specific function to it (rightmost of Figure 1). Lastly, substances have no shape and are made of non-solid materials with no boundaries (centre of Figure 1). Within each category, there will be four items that are being tested. As seen in Figure 1, the ambiguous object for each category is shown at the top with the shape alternative on the left and the material alternative on the right.

Results from the study showed that English monolinguals had a greater percent shape response for all item categories. In other words, Japanese monolinguals were more substance-biased when make categorization decisions. This is attributed to the presence of classifiers in the language. Would then differences in the classifier system affect how one performs categorization?

Generally, Chinese has greater specificity in the use of classifiers while classifiers in Japanese take on a broader scope of objects. The size of the classifier category is also much larger than that of the Japanese. Earlier studies such as Schmitt and Shi (1998) and Kuo and Sera (2009) have demonstrated that differences in classifier systems affects thought, and in turn, categorization when they tested Japanese and Chinese native speakers in a similarity judgment task based on scope of classifiers in each language. It is also proposed that there is an amplified classifier similarity effect in Chinese compared to Japanese as the classifier classes are marked more systematically in the former (Saalbach, Zurich and Imai, 2011).

Aims of the Current Study

Extending from the finding of these studies, we predict the following that since Chinese have more classifiers and narrower scope for each classifier in its classifier system,

Hypothesis 1(a) Chinese monolinguals will classify things according to its substance more than Japanese monolinguals.

Hypothesis 1(b) English monolinguals will have the least substance responses since it is not a classifier language.

While it is necessary that we understand how different languages govern thought and categorization, it is important that we understand how learning and acquisition of another language, be it similar or different to the first, shapes our cognitive processes. This is in view that bilingualism and multilingualism is fast becoming a norm with increasing globalisation. While some countries like Singapore are multilingual with its citizens raised as bilinguals from a young age, there are also conventionally monolingual societies like China which are implementing the learning of English as a second language through schools. Next, there is increased migration of individuals to cultures different from their own in search of education and job opportunities resulting in the need to acquire a new language.

Following from earlier theories on language acquisition and bilingualism, learning a new language, even if it is totally different from the previously known languages to the speaker, is not the introduction of a separate system into the brain. The new and existing languages will interfere and interact with each other, shaping the way we perceive and think about our world and see things. The possibility of integration of the two languages is thus not very far off. Inevitably, the process of language acquisition creates shifts in conceptual structures when the languages interact. A previous study by Cook et al (2006) on conceptual differences between their first language (L1) Japanese acquiring English as their second language (L2) and Japanese monolinguals revealed differences in categorization. There was a shift in responses from substance to shape for the Japanese that acquire English as their L2. As such, we make the next hypothesis,

Hypothesis 2(a) Sequential bilinguals (L1 Chinese, L2 English) will have more shape responses in the tasks compared to monolinguals due to the influence of the L2 acquired

Hypothesis 2(b) Sequential bilinguals (L1 Chinese, L2 English) will have more substances responses in the tasks compared to simultaneous bilinguals in English due to the interference of the L1

In the same study, Cook et al also noted that the Japanese group that stayed for a longer period of time in an English-speaking country demonstrated a greater shift towards shape responses than those who stayed for less than three years in the country, displaying categorization more similar to the English monolingual. It is suggested that besides language, culture also has an effect on categorization.

Classifier languages are usually associated with the East Asian culture which adopts a more holistic approach, giving more attention to the relations between objects and its environment. They tend to look at the constituent of an object in relation to the whole. On the other hand, Westerners (usually also speakers of Indo-European languages) take on a more analytic approach cognitively and looks at objects independently, in its entirety. Given the proximity of language and culture, the two factors are very likely to come together and influence how speakers of the languages categorize.

In a multilingual, multicultural and multiethnic society like Singapore, language and culture do not share a simple and direct one-to-one relation. Instead, there is interplay of multiple cultures and languages at work to shape thought. The average Singaporean grows up exposed and learning both their ethnic language (also known as mother tongue in Singapore) and the lingua franca, English. Thus, most Singaporeans are able to command at least two languages with considerable proficiency from as early as three years old when preschool education begin, making them native speakers of both languages. Following from this argument, both languages should be equally represented in the brain and the influence of each language on the other should be similar, resulting in a more "neutral" position, without bias.

However, the language of instruction in school is usually in English and serves as a lingua franca across all ethnicities. English is also the official language of the country, giving it greater economic importance. Moreover, Singapore was previously a British colony and on the receiving end of the Western culture.

Even though there is still the ethnic culture present which resembles more to the East Asian cultures, the influence seems to be less far-stretching. The ethnic language is also commonly taught as a language class in school only and used with family and friends. There are also

dialectal differences between Chinese and Singaporean Chinese, though the latter was derived from the former. From this understanding, we make a third hypothesis on how culture affects categorization.

Hypothesis 3 Simultaneous bilinguals in Singapore tend to categorize more like the English monolingual due to stronger Western influences in the society and education system

Undoubtedly, there is an interaction between linguistic categories and the background knowledge available in the culture to shape how we look at the world we live in. Through this study, it is of interest to examine how the factors of language and culture interact to affect thought, specifically categorization of different types of objects.

For the purpose of this study, all stimuli used will be referred to as items to encompass both objects and substances and not to confuse with the notion of an object which refers to an entity that can be viewed as an individual unit.

In summary, the hypotheses presented above can be represented using the representational model of languages proposed below (Figure 2). The points of investigation are:

i. The representation of the Chinese language on the scale
   On the scale below, English occupies the point with the highest percent shape response and Japanese at the other end with much lower percent shape response. Will Chinese have an even lower percent shape response due to its larger classifier category size?
ii. The extent of similarity in categorization to English and Chinese for bilinguals differing in language dominance, with the sequential bilinguals stronger in Chinese and simultaneous bilinguals who are balanced in both languages

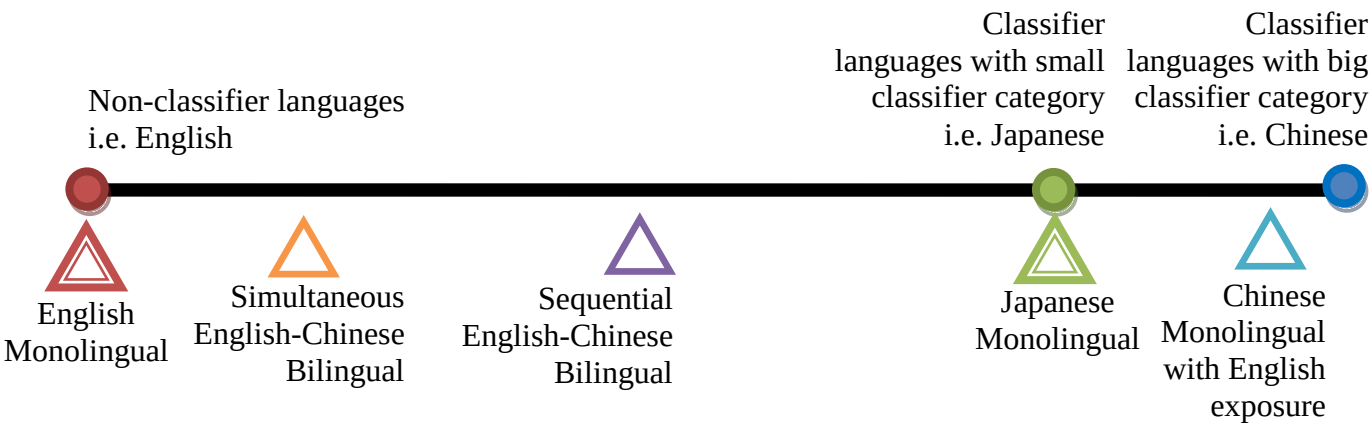


Figure 2(a) – Representational Model of Language and Categorization Responses of Singapore (Hypothesis)

Methodology

Subjects

A total of 3 groups of participants were involved in this study – 20 Chinese monolinguals (13 males, 7 females), 22 Chinese-English sequential bilinguals (11 males, 11 females) and 22 English-Chinese simultaneous bilinguals (11 males, 11 females). Participants were between the ages of 18 to 25 and are currently university undergraduates.

Chinese Monolinguals

Constrained by age and education factors, there were limitations in obtaining participants who were pure monolinguals in Mandarin Chinese. As such, Mandarin speakers with some exposure to English were used to form the baseline for this study. The participants are from Hebei, China and are monolingual speakers of Mandarin Chinese before the age of nine. Only Mandarin Chinese is used in the region. There are no other forms of Chinese varieties present. When schooling starts at the age of six, all lessons were conducted in Mandarin. Formal education in English starts at only about nine years of age. English lessons are usually held once a week, two hours per lesson, and are sometimes conducted using Mandarin Chinese. The duration of English lessons increases to about four to five hours a week as they progress to high school. In these classes, students perform simple dialogue practices and are taught vocabulary and writing skills. Their examinations test only for the written and listening skills of the language. It is only at the university level that emphasis is placed on the spoken aspect of the English language. Nevertheless, most of the lessons are still conducted in Mandarin Chinese.

For the purpose of this study, there were a few additional conditions for to qualify subjects as participants. They also must not have stayed in an English-speaking country for more than three months, taken regular English lessons apart from school and only start to gain exposure to the language after 8 years old.

Chinese-English bilinguals (henceforth referred to as sequential bilinguals)
The Chinese-English bilinguals are from the People's Republic of China and are currently taking up residence in Singapore to pursue their undergraduate studies in Nanyang Technological University (NTU). Participants have stayed in Singapore for at least ten months and have either passed the Qualifying English Test (QET) upon admission to the university or are undergoing English proficiency classes offered by the university. This ensures a reasonable proficiency in English required by the study and keep the culture variable similar to the group of English-Chinese bilinguals. The participants also must not have been stayed in an English-speaking country for a prolonged period of time prior to coming to Singapore. The profile of the Chinese-English bilinguals is very similar in their background to the Chinese monolinguals in this study except for their country of residence and the language of instruction in their respective universities (Chinese for Chinese monolinguals in China and English for the Chinese-English bilinguals in Singapore). They are considered to be Chinese language dominant.

English-Chinese bilinguals (henceforth referred to as simultaneous bilinguals)
The English-Chinese bilinguals are Singaporeans and have not taken up any residence overseas prior to the study. Most are considered to be balanced in both English and their Mother Tongue language (Chinese in this case), with no display of dominance in either language. Their performance in the GCE O level for both languages serves as proficiency indicators with the aspects of oral communication, writing and comprehension skills being tested. Listening is also being tested for Chinese. All participants would have obtained a minimum score of B in both languages to demonstrate an above average command of the languages, qualifying them for the study. It is also noteworthy that all education in Singapore is conducted in English.

Materials
The stimuli used for the study are based on Imai and Gentner's study in 1997 on "a cross-linguistic study of early word meaning: universal ontology and linguistic influence". The materials were kept as close to the original with the exception of the UFO object and leather

sample. This provided a basis of comparison of differences between monolinguals in Japanese, English and Chinese. The stimuli come from three different item categories – simple items, complex items and substances. There are four sets of selection tasks to be carried out from each group. Pictures used are either self-taken or used with permission given from online sources (Refer to Appendix A for images of the stimuli).

Test Object (Standard)		Shape Alternative	Substance Alternative
Complex Item			
1	Clear Plastic Clip	Metal Clip	Clear Plastic Piece
2	Ivory Plastic Tee Joint	Copper Tee Joint	Ivory Plastic Pieces
3	Porcelain Lemon Juicer	Wood Lemon Juicer	Porcelain Pieces
4	Wood Whisk	Black Plastic Whisk	Wood Pieces
Simple Item			
1	Cork Pyramid	White Plastic Pyramid	Piece of Cork
2	Dylite Zero	Wood Zero	Dylite Piece
3	Red Angel Clay Half Egg	Gray Styrofoam Half Egg	Red Angel Clay Pieces
4	Orange Wax Kidney	Purple Plaster Kidney	Orange Wax Pieces
Substances			
1	Lumpy Nivea (in reverse C-shape)	Hair-styling Gel (in reverse C-shape)	Nivea Piles
2	Crazy Foam (in Gamma shape)	Clay (in Gamma shape)	Pile of Crazy Foam
3	Sawdust (Omega)	Brown Paper (Omega)	Two Piles of Sawdust
4	Decoration Sand (in S-shape)	Glass Pieces (in S-shape)	Three Piles of Sand

Table 3 – Stimuli used for the study

Procedure

All participants were recruited through personal contacts of friends. Liaison was carried out only through emails in three stages (Appendix B). In Stage I, participants were given the Participant's Informed Consent Form (Appendix C & D) and a language questionnaire to qualify them as participants (Appendix E-G). All participants gave signed and informed consent approved by the University before carrying out the testing in the next stage. In Stage II, there were given a specific link to access the experiment and perform the tasks. Upon completion, in Stage III, a debriefing form was given to explain and clarify the rationale and purpose of the study (Appendix H). Finally, all the results are then computed and analyzed for discussion (refer to 'Results' section).

Experiment

Online testing was chosen as the group of Chinese monolinguals were not accessible for face-to-face testing. This is different from how Imai (2000) and Cook et al (2006) conducted the study with the use of actual objects. Written form of instructions were given instead of auditory commands to prevent biasing that may occur due to language variations, namely

between Singaporean Chinese and Chinese Chinese. To avoid the language effect in the experiment, the samples were counter-balanced with half the participants in each group and gender taking the test with instructions in Mandarin Chinese and the other half in English. This is with the exception of the Chinese monolinguals with the test administered to all of them in Mandarin Chinese. The questions presented in the test were also randomized using a computer program and balanced across all participants to minimize biasing due to group effect.

On the experiment page, participants were asked to click the on-screen to start the experiment (请点击这里开始试验). The picture of the ambiguous picture would be shown with the instruction to 'Click the picture that is the same as above' (请选择于以上相同的图片) before flashing the shape and substance alternative to the image. Participants were asked to click on the button to continue with the experiment. There are a total of twelve ambiguous images. No names were given to the objects tested as the names may prime subjects towards either language (Refer to Appendix I).

Results & Analysis

The ANOVA test for significance was done at 10% significance level to examine if there are statistically significant differences in the results arising from the independent variables of test language, language dominance and gender. The statistical test showed a main effect of language dominance ($p=.078$) but no main effect of test language ($p=.483$) and gender ($p=.112$). This means that there is a found correlation between the responses given with the language dominance of the participant (i.e. sequential and simultaneous bilinguals). Differences arising from the factors of gender and test language are not statistically significant. It is also worthy to note that there is an interaction effect between test language and language dominance ($p=.078$). This suggests that there is a possible interaction between the language dominance and language of the test administered in affecting the responses given by the bilingual participants.

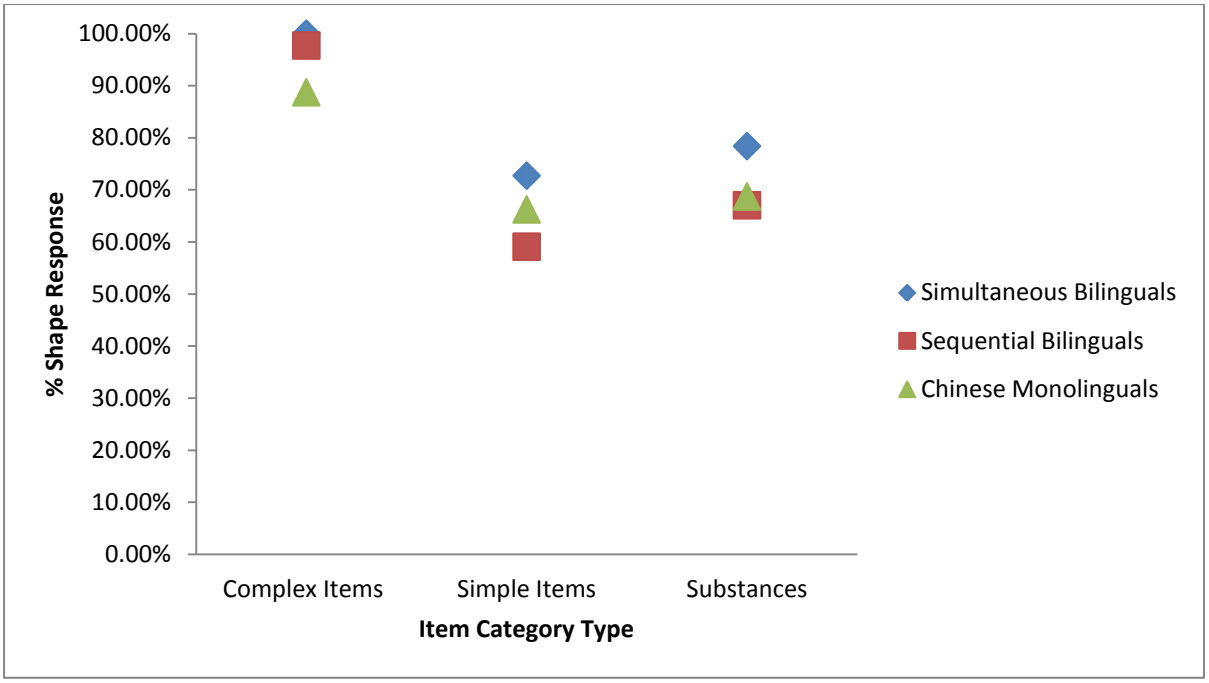


Figure 3 – Average Percent Shape Response across Item Category Type and Group

	Complex Items	Simple Items	Substances
Simultaneous Bilinguals	100.00%	72.73%	78.41%
Sequential Bilinguals	97.73%	59.09%	67.05%
Chinese Monolinguals	88.75%	66.25%	68.75%

Table 3 – Average Percent Shape Response across Item Category Type and Group

It is also found that there is a very strong correlation between the item category and the alternative selected for the item. The ANOVA test showed a main effect of item category type ($p<<.001$) when comparing responses of all participants across the item category types. Thus, the responses generated are affected by the category which the complex item is in. Consistent with Imai's study, all three groups of participants have the highest shape response to the categorization of complex items, judging it to be more similar to its shape rather than the substance alternative (Table 3). This is evident of a stronger shape preference across all groups when dealing with complex items as the shape of the object is governed by the function they serve.

For simple and substance items, there is a significantly lower percent shape response compared to complex objects, which is also similar to Imai's study. However, there was a greater shape response for substances than simple items across all groups of participants. The difference in the percent shape response for both item categories is significantly smaller (less than 9% while in Imai (2000), difference between the two item category for Japanese and

English monolinguals was at least 10%), showing a weaker distinction between the two categories. Theoretically, responses for substances should show the lowest percent shape response among the three item categories as they are shapeless and biased towards the substance material alternative. This was illustrated both by Imai's study (2000) on Japanese and English monolinguals as well as Cook's study (2006) on Japanese monolinguals acquiring English.

In both studies, participants had the highest percent shape response to complex items followed by simple items then substances. This difference in finding is likely to be due to differences in how the experiment is being carried out. While the experiment was conducted with actual items in previous studies, the experiment in this study is done online with images of these items. When viewing photographs of the items, only two dimensions (length and width) of the items are captured. This is in contrast to seeing the actual item on three dimensions (length, width and height). With the missing dimension of height, the item captured in the photograph may look flat, making it more like the shape than the substance alternative. Hence, the disparity in findings from this study and earlier studies could be due to this lack of dimension when viewing the picture instead of the actual item since the test items used were very similar to Imai's study (2000). This could also have attributed to the consistently higher percent shape responses across all three item categories for this study. As such, the analyses following will omit the discussion of the percent shape responses of substances as it is an anomalous finding inherent to the experimental setup.

Generally, it is found that simultaneous bilinguals had the highest percent shape responses for all item categories followed by the Chinese monolinguals then the sequential bilinguals. This supports the hypothesis of sequential bilinguals being more likely to choose the substance alternative to simultaneous bilinguals arising from their language dominance in Chinese. However, contrary to what was hypothesized of their response compared to the Chinese monolinguals, the sequential bilinguals had a higher preference for substance alternatives, reflected by a lower percent shape response (Table 4).

Cook et al (2006) in a similar study reported of Japanese-English bilinguals' preference for material (substance) responses for simple objects and substances, similar to the Japanese monolingual. However, the group that stayed in an English-speaking for more than three years had responses which were more likened to the English monolingual, showing greater shape preference compared to the bilinguals that stayed in an English-speaking country

between six months to three years. And it is noted that the performance of the Japanese-English bilingual across all item category type was in-between that of the English and Japanese monolingual, but this was not the case for our sequential monolinguals when comparing with the Chinese monolingual (Table 4).

A possible explanation for this finding is that as most of the sequential bilinguals are still undergoing English proficiency classes to acquire English, they gain greater sensitivity to language cues. In such language classes, great emphasis is placed on teaching grammar rules like the noun-verb agreement on number. As a result, language learners have a heightened sensitivity to these cues in their second language, namely English. This extra sensitivity of sequential bilinguals towards English in turn reverses their sensitivity in their first language, Chinese and helps them to draw a greater distinction in individuation than the simultaneous bilinguals.

On top of that, for the sequential bilinguals, only Chinese was used in their home country and code-switching is a very rare phenomena. This is in contrast to multilingual Singapore where code-switching is considered normal with Singaporeans switching between English and their mother tongue, as well as speaking the local dialect Singlish which is a mix of languages in itself. Inevitably, their increased exposure to English also affects their view and use of the language. Consequently, sequential bilinguals are more sensitive to the administered test language, giving a lower percent shape response compared to the Chinese monolingual and simultaneous bilingual. Additionally, their percent shape response performance is closer to that of the Chinese monolinguals although comparatively lower.

	Complex Items	**Simple Items**	**Substances**
Simultaneous Bilinguals	100.00%	72.73%	78.41%
Sequential Bilinguals	97.73%	59.09%	67.05%
Chinese Monolinguals	88.75%	66.25%	68.75%
English Monolinguals[1]	95.00%	72.00%	50.00%
Japanese Monolinguals[2]	90.00%	27.00%	17.00%
Japanese-English Bilinguals[3]	88.00%	31.00%	17.00%

Table 4 – Comparison of Average Percent Shape Response across Studies

Comparing the results in this study with those of the English and Japanese monolinguals reported in Imai (2000), the Chinese monolinguals are found to give responses in-between

[1] Data for English monolinguals are extracted from Imai (2000)
[2] Data for Japanese monolinguals are extracted from Imai (2000)
[3] Data for Japanese-English bilinguals are extracted from Cook et al (2006).

that of the Japanese and English monolinguals with the exception of substances (which has been clarified earlier in this section).

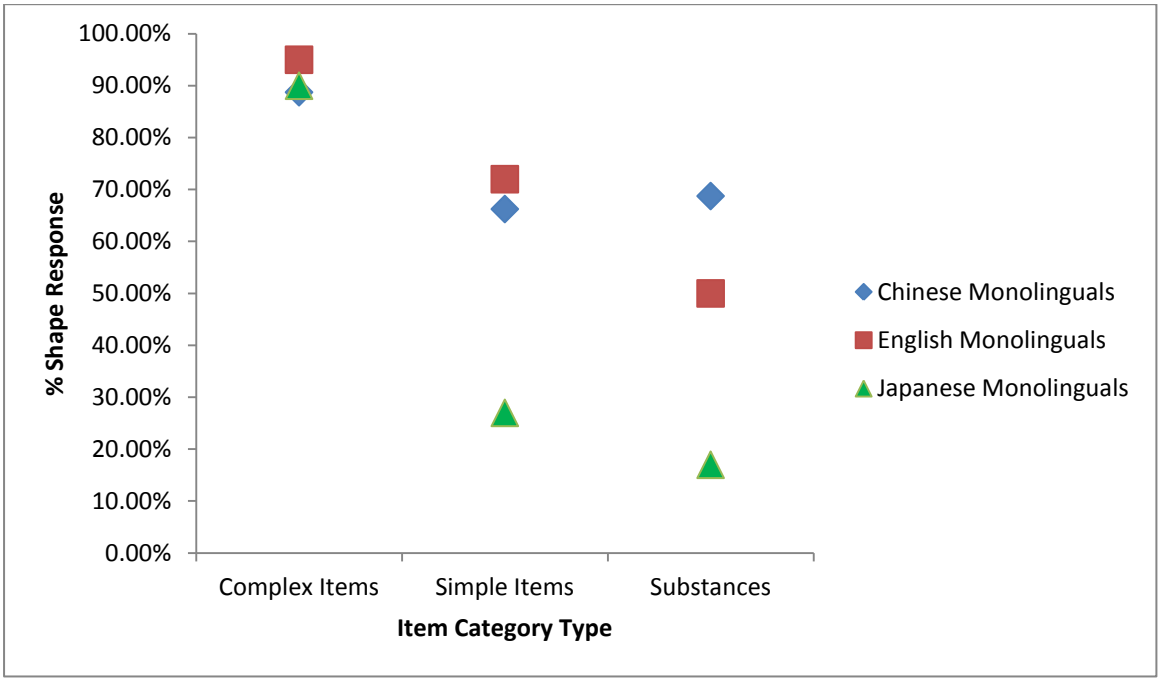


Figure 4 – Monolinguals Average Percent Shape Response across Item Categories

Even though it was hypothesized for Chinese monolinguals to have lower shape percent responses compared to the Japanese because of the amplified classifier similarity effect, the results have shown otherwise. This suggests other possible aspects of language that govern thought such as language use. In Chinese, the use of classifiers is almost mandatory while it is optional in Japanese and at the same time, the use of the classifier is also more specific, indicating a more marked distinction between objects and substances (Table 3). As such, Chinese is possibly more alike to English than Japanese because of the stronger distinction between objects, explaining their in-between responses to that of the Japanese and English monolinguals.

	Chinese	**Japanese**
Frequency of Use	Almost Mandatory	Usually Optional
Classifier Category Size	Much larger than Japanese	Relatively Smaller than Chinese
Scope of Classifiers	Narrow and specific use and is more systematically marked	Broader scope of use

Table 5 – Classifier Features in Chinese and Japanese

Discussion

With the findings presented above, the following changes are made to the model proposed in the introduction (Figure 2(a)).

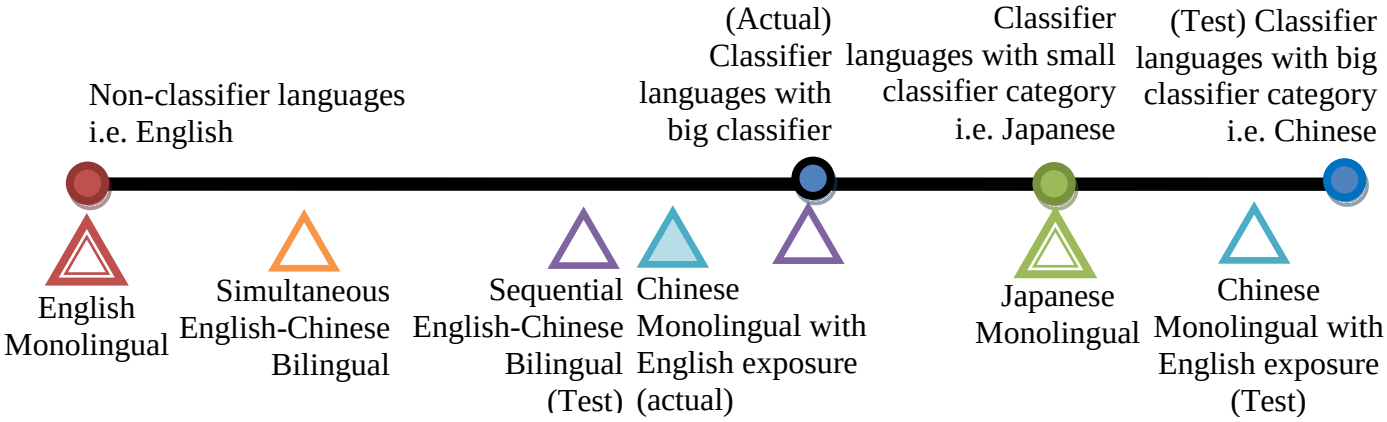


Figure 2(b) – Representational Model of Languages and Categorization Responses of Speakers (Actual)

As hypothesized, the simultaneous bilinguals had a higher average percent shape response than the sequential bilinguals and their categorization of the ambiguous items in the task was closer to that of the English monolinguals. This suggests that the language of the society does affect thought since the medium of instruction in school and the lingua franca is English. In addition, the presence of a dominant language in a bilingual will result in categorization being performed closer to how a monolingual of that language would be. In this case, the performance of the sequential bilinguals is relatively closer to that of the Chinese monolinguals than that of the simultaneous bilinguals. This is very likely to be due to their language dominance in Chinese. A very closely related factor which may have had affected the results is the subjects' proficiency in English and Chinese.

The simultaneous bilinguals in this study are considered to be fairly proficient in both English and Chinese while the sequential bilinguals are more proficient in their Chinese than English, hence showing language dominance in Chinese. Yet, it is important to have the understanding that the Chinese standard of the sequential bilinguals is much higher than that of the simultaneous bilinguals on the whole. This means that the Chinese could possibly have a greater grasp of classifiers in the language than the Singaporeans, creating greater sensitivity in categorization. As for their proficiency in English, Singaporeans undoubtedly have a higher proficiency in the language than the Chinese, given the early acquisition of the language coupled with its pervasiveness in society today. However the lack of inquiry into their language proficiency in English and Chinese at the point of testing makes it challenging to come to absolute and concrete findings on the language effect.

It is also important to understand that there are variety differences in English and Chinese between the participants in this study. In Singapore, the Colloquial Singapore English (otherwise known as Singlish) is known to mark number differently from English (referring to the British and/or American variety). The number marking system is argued by Kim, Chang and Lee (2009) to be systematic and not randomly optional, in other words, governed by its own set of rules. There is also a frequent violation of the rule concerning number-verb agreement. Hence, the finding from the comparison between Singapore simultaneous bilinguals and English monolinguals only serve as an estimate given the differences between standard English and the Singapore colloquial.

As for Chinese, the most important distinction between Chinese Chinese and Singapore Chinese is the use of classifiers. Taking the classifier 粒 'li' as an example, we see that the Chinese are more specific in its use than Singaporeans. In Singapore Chinese, anything that is round-like in shape can take on the classifier 粒 'li' such as 一粒西瓜 'a watermelon'，一粒苹果 'an apple'，一粒米 'a rice'. However, the first two instances are considered unacceptable in Chinese Chinese as the entity also need to be very small in order for the classifier 粒 'li' to be used. The generic classifier 个 'ge' is used for round-like entities that are bigger in size. In the case of the Chinese Chinese, 个 and not 粒 is used with the watermelon. The differences in the specificity and classifier used may lead to perceptual differences, as the classifier takes on nouns that has semantic features that it agrees with just like the 个/粒 distinction in Chinese Chinese but not Singapore Chinese. This is pertinent to our study since classifiers are used to show individuation and categorizes nouns.

While the findings support the hypotheses concerning how language affects categorization by bilinguals, the first hypothesis of Chinese monolinguals giving greater substance response than Japanese monolinguals is found to be false. As seen from Figure 2(b), the responses given by the Chinese monolinguals participants have a greater average shape responses (shaded blue triangle shows actual result; unshaded blue triangle refers to initially expected result following from the hypothesis) than the Japanese monolinguals, i,e. Japanese monolinguals were more likely to choose the substance alternative than the Chinese monolinguals. A possible explanation for this occurrence is that count classifiers in the classifier system in Chinese are parallel to the count/mass distinction in English in showing individuation (Table 6). The proposition of classifiers as count syntax is first brought up by

Li, Barner and Huang (2008) when they investigated individuation and measurement in the acquisition of Mandarin Chinese.

English	**Mandarin**
Noun + count syntax → individuals	Noun + count classifier → individuals
Noun + no count syntax (i.e., mass noun phrase) → unindividuated stuff or individuals	Noun + no count classifier (i.e., bare noun phrase) → unindividuated stuff or individuals
Noun + measure word → measure of stuff or set of individuals	Noun + measure word → measure of stuff or set of individuals

Table 6 – Parallels between English and Mandarin to show individuation
[Extracted from Li, Barner and Huang (2008)]

Given the similarity of English and Chinese in showing individuation, coupled with the mandatory and frequent use of classifiers in Chinese, it may be that Chinese bears a greater similarity to English than Japanese in drawing shape and substance distinction. As such, the representation of the Chinese language on the scale will be between Japanese and English, closer to Japanese (indicated by blue circle with black outline). An additional feature, frequency of use of classifiers (mandatory or optional), is probably required to make the representational model more comprehensive so that other classifier languages can be plotted on the scale based on the features of its classifier category.

Lastly, there was an existing limitation inherent in carrying out this study. The original study by Imai and Gentner (1997) was done face-to-face with actual objects. However, this study was done online due to the limitations in reaching the participants in China to form the baseline for this study. This might have changed the dynamics of the experiment and the representation of the ambiguous object over still image may not be as accurate as an actual viewing of the object. The dimensions and texture of the object is also not viewed as clearly even though efforts were made to make as accurate a representation of the initial and real object. The percent shape response is significantly and consistently higher in all three groups of participants in the study than it was in Imai's study on universal ontological knowledge investigating Japanese and English monolinguals. As such, differences could possibly have arisen from stimuli and experiment design differences. These differences can be tested either by using the same questions and method of testing on Japanese and English monolinguals or by carrying out the face-to-face experiment with Chinese monolinguals and bilinguals in English and Chinese.

Future Work

First and foremost, this study can be repeated with Japanese and English monolinguals. The results from the repeated study can be compared to the results of the Japanese and English monolinguals in Imai (2000) to determine if differences in experimental procedures have a significant effect on the results. Alternatively, running the experiment with actual objects on the same demographics of participants in this study will also determine if the findings of this study are valid. One crucial question that can be addressed by doing so is if the distinction between simple items and substance is significantly reduced when the test is carried out with images instead of objects. It appears that the loss of perceptual dimension could have contributed significantly to the variation in results.

However, if the problem caused by the lack of dimension in viewing substances can be resolved, it will be very useful for the replication of this study across cultures and languages. By being able to do the test online, researchers will not be as restricted in terms of time and participants. As many participants can take the test simultaneously, this makes it easier to collect larger sample sizes to give statistically significant data. It also allows researchers to not have to be personally present in a culture to access participants in the culture, just like how Chinese monolinguals participants were accessed in this experiment. By being able to do so, it makes it easier to run additional studies on different cultures and language types. At the same time, there can be larger number of participants to provide us with statistically significant data. Possible solutions to resolve the loss of dimension when using images include using a better quality camera and to take photographs of the substances occupying the entire frame since substances are regarded as boundless entities. A norming test can be carried out with the general population to determine if these images accurately portray substances.

Next, we can also compare different groups of bilinguals. As addressed earlier on, English-Chinese bilinguals in Singapore do not speak solely the standard variety. The Colloquial Standard English distinguishes itself from the standard with the lack of number-verb agreement. This makes the language more resemblance in this aspect to Chinese where there is no number-verb agreement in the language. Inevitably, a shift in responses towards the Chinese monolinguals may occur. Running the same study on simultaneous Chinese-English bilinguals in California will probably give a more accurate reflection of simultaneous bilinguals as they speak the standard varieties of both English and Chinese.

We have looked into differences in categorization between simultaneous and sequential bilinguals in this study. Hence, another aspect of bilingualism that will be worthy of examining is how does the language proficiency affect categorization. Athanasopoulos and Kasai (2008) found that there were minimal changes in categorization between monolinguals and intermediate users of the second language. The greater shift in categorization pattern came from the participants who became advanced users of the acquired L2. By varying the factors of proficiency and age of acquisition of each language, we can learn if language proficiency does indeed affect thought. And for sequential bilinguals, does the order of language acquisition matter? That is to say, will bilinguals who learn language A than language B think in the same way as bilinguals who learn language B then language A.

Pertaining to languages, as identified earlier, the frequency of use of classifiers can also contribute to the cognitive process of categorization. By testing different classifier languages on a spectrum, the results can help us to determine if the boundaries of individuation are truly shaped by language and its linguistic features. A possible language to test on is Malay. Malay, like Chinese, has a big classifier category but it is more like Japanese in its frequency of use of classifiers as Malay has an optional marking system. Hence, we would expect for the responses of Malay monolinguals to be an in-between of the Chinese and Japanese monolinguals if individuation indeed occurs on a spectrum.

Besides examining classifiers, we can also investigate if other forms of number marking shapes individuation. One such language is Tamil where there is grammatical marking for number, just like English. But the two languages are more different than they are the same. Tamil and English have different sentence structures and while articles are mandatory in English, they are not present in Tamil.

Conclusion

Through the examination of acquisition of a second language with contrasting linguistic features from the first, we see changes in the way how the subjects perceive the world and perform categorization on a triad matching test. It seems that for participants who are undergoing or have shortly completed their English proficiency classes develop an extra sensitivity to linguistic cues that are absent in their first language. However, we would expect this sensitivity to decrease and wear off as subjects gain proficiency in their second language. Their responses then will likely to be an in-between of monolinguals of the two languages,

like the simultaneous bilinguals. This supports the theory that different languages are not cognitively separate as the acquisition of a second language has been shown to create shifts in categorization pattern towards the L2. This shift seems to be permanent as a result of the reorganization of the language system in our cognition. Lastly, it is possible that languages may be more similar than we really think they are such as English and Chinese in showing individuation and there may be other languages and aspects of these languages that share such parallels.

References

Aikhenvald, Alexandra. Y. (2000). Classifiers: A Typology of Noun Categorization Devices. New York: Oxford University Press.

Athanasopoulos, Panos. and Kasai, Chise. (2008). Language and thought in bilinguals: The case of grammatical number and nonverbal classification preferences. *Applied Psycholinguistics*, 29:105-123

Athanasopoulos, Panos. and Kasia, Chise. (2011). Effects of second language on cognition in English users of L2 Japanese. *Vigo International Journal of Applied Linguistics*, 8:13-27

Brinton, Laurel J. and Brinton, Donna. (2010). The Linguistic Structure of Modern English. Philadelphia: John Benjamins Publishing Company

Cook, Vivian., Bassetti, Benedetta., Kasai, Chise., Miho Sasaki. and. Takashi, Jun Arata. (2006). Do bilinguals have different concepts? The case of shape and material in Japanese L2 users of English. *International Journal of Bilingualism*, 10(2): 137-152

Gao, Ming Y. and Malt, Barbara C. (2009). Mental representation and cognitive consequences of Chinese individual classifiers. *Language and Cognitive Processes*, 24 (7/8): 1124-1179

Gupta, Anthea, Fraser. (2008). The Language Ecology of Singapore. In Creese, A., Martin, P. and Hornberger, N. H. (eds.), *Encyclopaedia of Language and Education*, 2nd Edition, Volume 9: Ecology of Language (pp.99–111). United States: Springer

Henrik, Saalbach. and Imai, Mutsumi. (2010) Do Classifier Categories Structure our Concepts? http://www.psych.unito.it/csc/cogsci05/frame/talk/f327-saalbach.pdf Retrieved on Oct 22, 2011

Imai, Mitsumai. (2000). Universal Ontological Knowledge and a Bias toward Language-Specific Categories in the Construal of Individuation. In Niemeier, Susanne. and Dirven, René. (eds.) *Current Issues in Linguistic Theory*, 198: 139-161

Imai, Mutsumi. and Gentner, Dedre. (1997). A cross-linguistic study of early word meaning: universal ontology and linguistic influence. *Cognition*, 62:169-200

Kim, Chonghyuck, Qizhong Chang & Leslie Lee. (2009). Number Marking in Colloquial Singapore English. *Journal of Cognitive Science*, 10(2): 149-172.

Kim, Chonghyuck, Qizhong Chang & Leslie Lee. (2007). Singlish number marking is not random. Paper presented at SEALS17, Aug 31 - Sep 2 2007, University of Maryland.

Klein, Bernd. (2006). Classification of Bilingualism. In *Bilingual Upbringing of Children in the Home*. Retrieved Oct 30, 2011 from http://www.bklein.de/buc/buc_classification.php

Kouider, Sid., Halberda, Justin., Wood, Justin. and Carey, Susan. (2006). Acquisition of English Number Marking: The Singular-Plural Distinction. Language Learning and Development, 2(1):1-25

Kuo, Yi-Chun Jenny. and Sera, Maria D. (2009). Classifier effects on human categorization: the role of shape classifiers in Mandarin Chinese. *Journal East Asian Linguist*, 18:1-19

Lucy, John A. (1992). Grammatical Categories and Cognition: A case study of the Linguistic Relativity Hypothesis. Cambridge: Cambridge University Press

Lucy, John A. and Gaskins, Susanne. (2001). Grammatical Categories and the development of classification preferences: a comparative approach. In Levinson, Stephen C. and Bowerman (eds.). *Language Acquisition and Conceptual Development.* Cambridge: Cambridge University Press

Matsumoto-Gray, Katherine. (2009). Categorization: Connections between Language and Society. *Language, Meaning and Society*, 2: 107-135

Pakir, Anne, (2008). Bilingual Education in Singapore. In Cummins, J. and Hornberger, Nancy H. (eds.) *Encyclopedia of Language and Education*, 2nd Edition, Volume 5: Bilingual Education (pp.191-203). United States: Springer

Saalbach, Henrik. and Imai, Mitsumai. (2007). Scope of Linguistic Influence: Does a Classifier System Alter Object Concepts?. *Journal of Experimental Psychology: General*, 136 (3): 485-501

Saalbach, Herik., Zurich, ETH. and Imai, Mutsumi. (2011). The Relation between Linguistic Categories and Cognition: The Case of Numeral Classifiers. Psychology Press

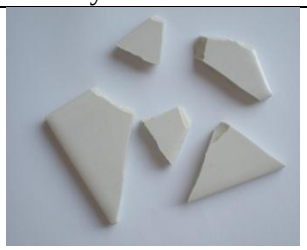
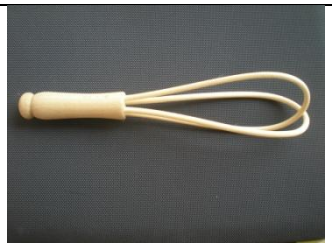
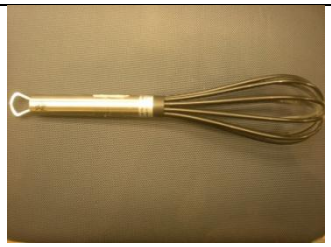
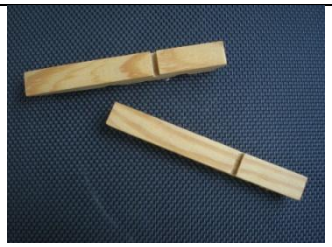
Schmitt, Bernd H. and Zhang, Shi. (1998). Language Structure and Categorization: A Study of Classifiers in Consumer Cognition, Judgement and Choice. *Journal of Consumer Reasearch*, 25(2):108-122

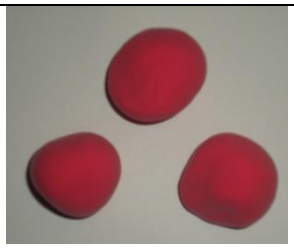
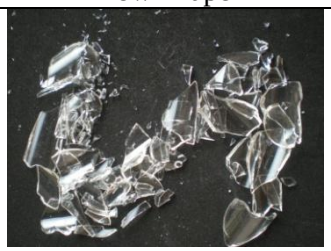
Singapore Examinations and Assessment Board. GCE O-Level Syllabuses Examined in 2011. Retrieved October 13, 2011, from http://www.seab.gov.sg/oLevel/GCEOsyllabus/schoolCandidates/2011_GCE_O.html

The World Atlas of Language Structures Online. (2011). WALS – Tamil. Retrieved Nov 12, 2011, from http://wals.info/languoid/lect/wals_code_tml

Yu, Liming. (2008). English-Chinese Bilingual Education in China. In Cummins, J. and Hornberger, Nancy H. (eds.) *Encyclopaedia of Language and Education*, 2nd Edition, Volume 5: Bilingual Education (pp.175-189). United States: Springer

Appendix A – Images of Stimuli Used

Test Object	Shape Alternative	Substance Alternative
 Clear Plastic Clip	 Metal Clip	 Clear Plastic Piece
 Ivory Plastic Tee Joint	 Copper Tee Joint	 Ivory Plastic Piece
 Porcelain Lemon Juicer	 Wood Lemon Juicer	 Porcelain Pieces
 Wood Whisk	 Black Plastic Whisk	 Wood Pieces
 Cork Pyramid	 White Plastic Pyramid	 Piece of Cork
 Dylite Zero	 Wood Zero	 Dylite Piece

Test Object	Shape Alternative	Substance Alternative
 Red Angel Clay Half Egg	 Gray Styrofoam Half Egg	 Red Angel Clay Pieces
 Orange Wax Kidney	 Purple Plaster Kidney	 Orange Wax Pieces
 Lumpy Nivea	 Hair-styling Gel	 Nivea Piles
 Crazy Foam	 Clay	 Pile of Crazy Foam
 Sawdust	 Brown Paper	 Two Piles of Sawdust
 Decoration Sand	 Glass Pieces	 Three Piles of Sand

Appendix B – Emails to Participants

Email #1 – Getting Participant's Consent and Language Background

你好！首先，我非常感谢您愿意参与我的研究项目。
在这研究测试能开始前，我必须让你详细地了解研究项目的一切内容并且得到您的签名表示同意。这一切已经列入在 'Informed Participants' Consent Form'的档案里。电子邮件还包括一个附件，其中包含了一份关于个人语言背景的问卷。请用普通话来回答。请您详读这两份文件，若有疑问之处，请尽管把它们提出来。这一切所收集的资料都不会损害到您的个人隐私或名誉。
我希望尽快您的回复以便进行下一阶段的测试。也因为报告呈交期也快到了。谢谢您！

祝您学业进步，
江韵蕊
语言学 Year 4
南洋理工大学

P.S. 关于你的签名，你可以把你的签名拍下。然后把它的图像插入文件。

Hi!
Attached is the Participation Informed Consent Form (PCF) and a language questionnaire on yourself. The PCF explains the purpose of the study and the process of the experiment. Do read through it carefully and clarify any doubts that you may have.
In addition, I would need you to sign at the end of the form to show that you fully understand what is going to happen and how the information will be used, without any compromise to your privacy. As for the language questionnaire, it is basically about yourself and your language abilities.
I will need you to email both forms back to me once you are done before moving on to the next part of the study, which I will send you a link to go to.

With thanks,
Yun Rui
Linguistics & Multilingual Studies Year 4
Nanyang Technological University

P.S. For the signature, you could take a picture of your signature and insert it as an image or sign via paint and insert it as an image.

Email #2 – Instructions to access and carry out the experiment

谢谢你的回复！下一个阶段就是进行测试。请你到这个网址进行测试：<link>

测试里一共有十二个题目。测试的时间应不会超过十分钟。你应该一次完成所有的题目。在进行测试的时候请注意以下几点：
1．点击按钮来开始测试
如果文字显示出乱码，请把游览器的编码设定改为 Unicode（UTF-8）.
2．按照屏幕上的指示进行测试。
3．当你完成所有的题目时，你会看到《谢谢你的参与》。

在进行测试时，若有遇到困难请通知我。谢谢！

Thank you for completing the language questionnaire and the participant's informed consent form. For the next stage of testing, please follow this given link and access the experiment page：<link>

The experiment will not take more than 10 minutes and you should finish all **TWELVE** QUESTIONS in one sitting. Here are some instructions when doing the test:

1. Click on the button to start the experiment.
2. Follow the on-screen instructions.
3. You will be able to see a 'Thank You' page at the end of the experiment.

Do feel free to check with me should you face any problem in completing the experiment. Thank you once again for your participation in my study!

Email #3 – Debriefing of Experiment

谢谢你参与我的研究测试！在这电邮的附件里解释了这次试验的目的以便让你多了解你所参与的测试。祝你在来临的考试里一切顺利。

Thank you once again for your participation in my study. Attached is an experiment debriefing form where the purpose and the rationale of the study is explained, should you be interested. All the best for your upcoming examinations!

Appendix C – Informed Participant's Consent Form (English)

Informed Participant's Consent Form

Student Investigator: Kong Yun Rui

The purpose of the study is to learn more about how bilinguals in English and Chinese think as compared to monolinguals in the respective languages. A total of 60 participants will be involved in this study.

If you agree to be in this study, the following will happen:
First, you will be required to do a questionnaire via email on your language background to provide information on the demographics of the participants in this study. The information given in this questionnaire will be used anonymously. After which, you will be required to go online to answer a total of 12 multiple choice questions. The total time taken for the questionnaire and online test will not exceed ten minutes each.

There is no underlying risk in this study known to the student investigator. There will also be no remuneration or direct benefit to you from these procedures. However, the investigator will learn more about bilinguals, and the knowledge gained may help others in the future.

If you have questions, you may reach Yun Rui at (+65) 91872371 or email gracekongyr@gmail.com.

Participation in this research is entirely voluntary. You may refuse to participate or withdraw at any time without penalty. All data and information collected will be kept completely confidential to the extent allowed by the law.

Based on the foregoing, you agree to participate in the abovementioned study. In addition, you declare that you understand the purpose, procedure and the risks involved in this study and have read this informed consent form in detail.

_____

Subject's Signature
Date

Appendix D – Informed Participant's Consent Form (Chinese)

被试知情同意书

学生研究者: 江韵蕊

这项研究的目是调查双语和单语的人在思考上是否有区分。一共有六十位参与者参与这项调查。

若你同意参加研究的话，首先你需要完成有关个人资料和在语言运用的问卷。之后，你需要等入网络来回答十二个选择题。所收集的资料将一切会用匿名来使用，不会为你带来任何困扰。每一项资料收寻都能在十分钟内完成。

本研究没有研究者所意识到的潜在份鲜活副作用。虽然参与本研究对你没有直接的收益。但是，从本研究所得知的有可能在将来会帮助其他人。

若你还有疑问，请电邮韵蕊 gracekongyr@gmail.com. 。

参与本研究是完全自愿的。你随时都可以不参与或退出研究。你的名字或其他可以确认你的信息将不会出现在材料中。

我申明我已经被告知本研究的目的，过程，可能的风险。我的所有的问题都得到满意的回答。我已经详细阅读了本被试同意书。我下面的签名表明我愿意参加本研究。

_____

签名

日期

Appendix E– Language Questionnaire (Chinese Monolinguals)

姓名:

年龄:

性别:

电邮地址:

教育水平/目前就读的学校:

国籍:

语言能力:

语言	接触语言的年龄	经常用语言交谈的对象	用语言编写的频率
中文		□ 朋友 □ 家人 □ 学校 □ 其它: _____	□ 每次 □ 常常 □ 有时候 □ 很少 □ 从来没有
英文		□ 朋友 □ 家人 □ 学校 □ 其它: _____	□ 每次 □ 常常 □ 有时候 □ 很少 □ 从来没有

你是否曾到使用英文的国家参与过海外交流活动?

□ 有。请注明哪一个国家和逗留的时间：_____
□ 没有

你在学校以外还有上英文课吗?

□ 有，请在以下注明详情:
频率: _____
请注明几时开始的 （请注明还有在进行吗）：
_____

□ No 没有

你会怎么形容你目前的英语水平呢?

_____

I hereby declare that all the information provided above is accurate to the best of my knowledge and allow the information to be used anonymously for research purposes only. 本人谨此声明以上所提供的所有信息以我所知是准确的。同时，本人也允许研究者在匿名之下使用这些资料来做研究。

_____
Signature 签名
Date 日期:

Appendix F– Language Questionnaire (Chinese-English Sequential Bilinguals)

Name 姓名:

Age 年龄:

Gender 性别:

Email Address 电邮地址:

Education Level/School 教育水平/目前就读的学校:

Nationality 国籍:

Duration of Stay in Singapore 在新加坡居住的时间:

Language Proficiency 语言能力:

Language 语言	Age of Exposure 接触语言的年龄	Domains of Spoken Use 经常用语言交谈的对象	Frequency of Written Use 用语言编写的频率
Mandarin Chinese 中文		□ Friends 朋友 □ Family 家人 □ School 学校 □ Others 其它: _____	□ All the time 每次 □ Most of the time 常常 □ Sometimes 有时候 □ Rarely 很少 □ Never 从来没有
English 英文		□ Friends 朋友 □ Family 家人 □ School 学校 □ Others 其它: _____	□ All the time 每次 □ Most of the time 常常 □ Sometimes 有时候 □ Rarely 很少 □ Never 从来没有

Have you gone on any overseas exchange programme to an English-speaking country (e.g. Europe, America) before coming to Singapore? 你在前往新加坡前是否到使用英文的国家参与过海外交流活动？

□ Yes, please specify where and duration of stay: _____
有。请注明哪一个国家和逗留的时间：_____
□ No 没有

Did you pass the Qualifying English Test (QET) upon admission into NTU? 你是否顺利通过入读南大之前的英文测验？

□ Yes 是
□ No 不是

Are you still undergoing English Proficiency classes provided by the University?
你现在还有上大学所设的英语水平进修班吗 ？
□ Yes 有
□ No 没有

I hereby declare that all the information provided above is accurate to the best of my knowledge and allow the information to be used anonymously for research purposes only.

本人谨此声明以上所提供的所有信息以我所知是准确的。同时，本人也允许研究者在匿名之下使用这些资料来做研究。

_____
Signature 签名
Date 日期:

Appendix G– Language Questionnaire (English-Chinese Simultaneous Bilinguals)

Name 姓名:

Age 年龄:

Gender 性别:

Email Address 电邮地址:

Education Level/School 教育水平/目前就读的学校:

Nationality 国籍:

Duration of Stay in Singapore 在新加坡居住的时间:

Language Proficiency 语言能力:

Language 语言	Age of Exposure 接触语言的年龄	Domains of Spoken Use 经常用语言交谈的对象	Frequency of Written Use 用语言书写的频率	O Level Score 'O'水准的成绩
Mandarin Chinese 中文		□ Friends 朋友 □ Family 家人 □ School 学校 □ Others 其它: _____	□ All the time 每次 □ Most of the time 常常 □ Sometimes 有时候 □ Rarely 很少 □ Never 从来没有	
English 英文		□ Friends 朋友 □ Family 家人 □ School 学校 □ Others 其它: _____	□ All the time 每次 □ Most of the time 常常 □ Sometimes 有时候 □ Rarely 很少 □ Never 从来没有	

Have you taken residence in any country outside of Singapore for more than 6 months? 你是否有在新加坡以外的国家居住过六个月以上?

□ Yes, please specify where and duration of stay: _____
有。请注明哪一个国家和居住的时间: _____

□ No 没有

I hereby declare that all the information provided above is accurate to the best of my knowledge and allow the information to be used anonymously for research purposes only.
本人谨此声明以上所提供的所有信息以我所知是准确的。同时，本人也允许研究者在匿名之下使用这些资料来做研究。

_____
Signature 签名
Date 日期:

Appendix H – Debriefing Form

研究项目名称：
Shape or Substance? : A Cross-linguistic Study of Bilinguals in English and Chinese

前人研究发现语言能影响我们的思维以及如何去分类我们所看到的。本研究的目的是调查学习另一个语言是否会影响我们思维的过程。 另外，也探讨在不同语言之间是否有这思维上的不同。

在本研究所用到的测试是从 Mutsumi Imai 和 Dedre Gentner 在 1997 年里的一项研究称 “A cross-linguistic study of early word meaning: universal ontology and linguistic influence”. 从参与人的选择，研究者得到人们如何思考的见解。

若你对于你的参与有提问，请随时发电邮询问。我的电邮地址是 gracekongyr@gmail.com 。 此外，你也能联络我的监督导师，Francis Bond 副教授。他的电邮地是 bond@ieee.org.

谢谢你的参与！

Title of Project:
Shape or Substance? : A Cross-linguistic Study of Bilinguals in English and Chinese

Language has been found by some researchers to influence the way we categorize the things we see around us. The purpose of this study is to investigate if the learning of another language will affect this process and if there are differences between speakers of different languages.

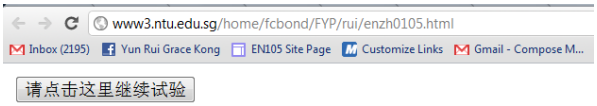
The experiment used in this study is a replication of an earlier study by Mutsumi Imai and Dedre Gentner in 1997 on “A cross-linguistic study of early word meaning: universal ontology and linguistic influence”. Through the choices you make in the experiment, we will gain insights on how categorization is being done.

Should you have any concerns about your participation in this study, do feel free to contact me at (+65) 91872371 or gracekongyr@gmail.com. Alternatively, my supervising professor, Assoc Prof Francis Bond can be reached at bond@ieee.org .

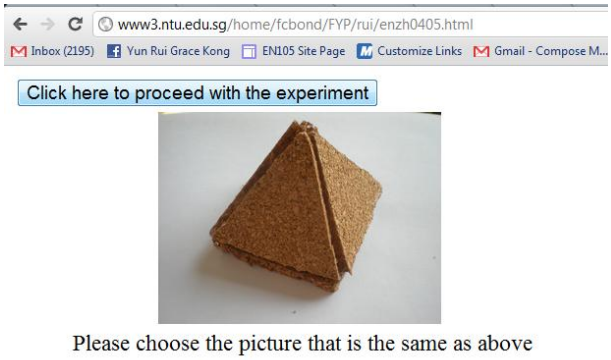
Thank you for your participation in this study!

Appendix I – Screenshots of Online Experiment

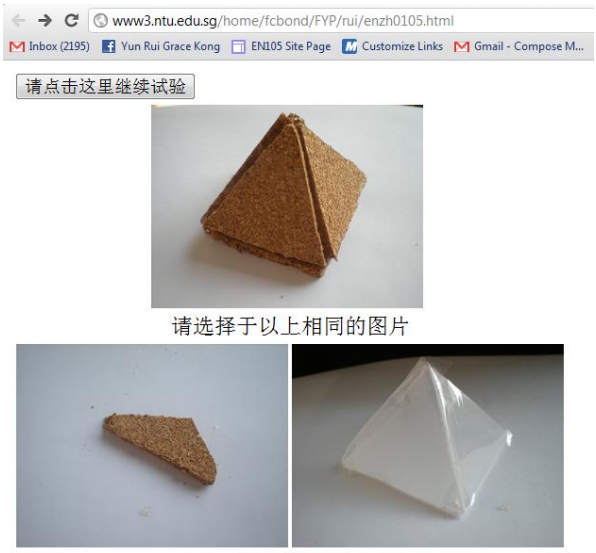
1. To start the experiment:

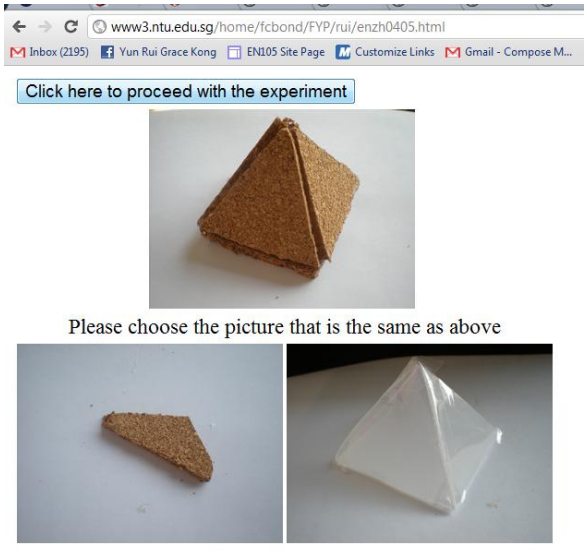


2. Showing of Question:

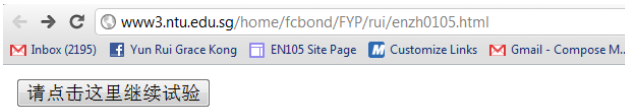


3. Showing of Shape and Substance alternatives:





4. To continue with the experiment:



Steps 2 to 4 are repeated until all 12 questions are done.

5. When the last question is completed, a ‘Thank You’ page screen will be flashed.