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LT3211 Semantics
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# Interpretation of scope ambiguity in English by English native speakers and Chinese bilingual speakers

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## 1. Introduction and literature review

A simple English sentence may be interpreted in two different versions because of different ways of thinking. How English native speakers and Chinese bilingual speakers interpret the scope ambiguity will be discussed in this paper. To begin with, scope ambiguity means an ambiguous sentence with two scopal expressions (Kearns, 2011). The ambiguity refers to not only that single word but also the other elements (Flax, 2018). Both of these two scopal expressions are logically possible interpretations. These two interpretations share the same surface structure but different deep structure. Scope ambiguity is at logico-semantic level (Kurtzman & MacDonald, 1993, p.2). When the quantifier scope such as every, some, a, many or a few exists in the same sentence for twice or more than two time in the determiner position, scope ambiguity may occur. Their structures are logically same but their ordering of these relative scope are different.

In this project, we use EO to represent the interpretations that 'every' take the scope over 'one' in the sentence. Similarly, OE represents 'one' take the scope over 'every'. According to Scontras, Tsai, Mai and Polinsky (2014), a sentence with 'every' and 'a' can be interpreted as both surface scope and inverse scope. The inverse scope is an inversion of the scope of subject and object quantifiers. When two sentences contain both 'every' and 'a' at different positions, they have similar ambiguity but just a change in the linear order of the two quantifiers.

## 2.Hypotheses and Aims

Three hypotheses are made. First, scope ambiguity is smaller in Chinese but bigger in English by the native English speakers. The inverse version will be much lower than surface version in both EO and OE in Chinese but will be relatively higher in English. Second, passive structure will not change the understanding of native English speakers but it will enlarge the scope ambiguity in both Chinese and English of Chinese speakers. Third, English of bilingual Chinese speakers will not be the same as that of native English speakers. It will be relatively similar as Chinese.

This project has two aims. One is to find resolution on ambiguity. According to Kurtzman and MacDonald (1993), we interpret the meaning of a given sentence unconsciously and very fast. It is an instant and automatic reaction after we heard an utterance. The other is to avoid misunderstanding. For example, Chinese speakers interpret 'Every fish was caught by a shark' as a shark who caught all the fishes but English speakers interpret it as each fish was caught by one individual shark.

## 3. Methodology

Three surveys were set up for three groups of language speakers, which are native English speakers, native Chinese speakers and bilingual speakers (first language Mandarin, second language English).

### 3.1 Survey design

In the survey for native speakers, there are 22 stimuli, either in pure English or pure Chinese. In the survey for bilingual speakers, there are 44 stimuli which feature a mix of 22 English and 22 Chinese stimuli. Stimuli are presented as sentence-picture pairs featuring one statement and one image below consisting either the surface or inverse scope interpretation. Only half of the stimuli consist of doubly-scope ambiguous statement and the rest are fillers.

### 3.2 Stimuli design

The order and scope factor were manipulated like a previous experiment (Scontras et al., 2014). For the order factor, we provide statements that either 'every' precedes 'one/a' (EO) or 'one/a' precedes 'every' (OE) at surface. For the scope factor, we provide both surface and inverse interpretation of each 'OE' and 'EO' statement. In addition to the above two factors, we also manipulate the "passive/ active' factor by providing two passive statements with either "EO" or "OE" structure. In this study, we interpret the surface reading of passive statements like "A fish was caught by every shark" as 'EO' structure because its active form is "Every shark caught a fish". Example of all 16 kinds of stimuli are listed in the appendix.

### 3.3 Distribution channels

We use Google form to collect our data. For native English speakers, we present them the survey in person and we observe if they show any hesitation when doing the survey. For both bilingual and Chinese native speakers, we send them a link of the survey and the participants complete the survey by themselves. We interviewed them after the survey to see if they have any confusion.

### 3.4 Participant Profile

There are 8 participants in native English survey and also 8 in native Chinese survey. There are 34 participants in bilingual survey. For bilingual participants, they are all native mandarin speakers studying in English-speaking universities and aged around 20 to 26, which ensure

they have similar language experience. For native English participants, all of them are currently university students from English speaking country, with no knowledge of Chinese. Chinese native participants are all around 50 to 65 years old with relatively low knowledge background. Both factors don't affect the result of our experiment as we focus on existence of scope ambiguity from native speakers' point of view.

**4. Results analysis**

The results were made into three forms and compared through paragraphs.

| | Surface | Inverse |
|---|---|---|
| EO | 100 | 62.5 |
| OE | 75 | 75 |
| passive EO | 100 | 62.5 |
| passive OE | 62.5 | 100 |

Table 4.1. Results of English Native speakers-percentage of true

For the sentences, English native speakers fully understand EO surface but not EO inverse. And both interpretation of OE are high about 75%. When EO sentences were changed into passive structures, interpretations do not change. But passive structure of OE makes people more aware of inverse interpretation. These results also indicates that scope ambiguity in English is obviously exists because all terms are over 50%.

| | Surface | Inverse |
|---|---|---|
| EO | 87.9 | 46.35 |
| OE | 67.4 | 14.85 |
| BEI_EO | 15.2 | 81.8 |
| BEI_OE | 58.8 | 70.6 |

Table 4.2. Results of Chinese Bilingual speakers(Chinese questions)

Chinese bilingual speakers made different choices. Surface is much higher than Inverse in both EO and OE (OE inverse is higher than expectation), which indicates that inverse interpretation is seldom allowed in Chinese. For passive structure of EO, interpretation turns to inverse. For passive structure of OE, both interpretations are above 50%, which shows scope ambiguity is enlarged.

| | Surface | Inverse |
|---|---|---|

| | | |
|---|---|---|
| EO | 82.3 | 56.05 |
| OE | 72.7 | 15 |
| passive EO | 23.5 | 70.6 |
| passive OE | 69.7 | 78.8 |

Table 4.3 Results of Chinese Bilingual speakers(English questions)

Surface meaning of both EO and OE is higher than Inverse. But the ratio of EO inverse is still higher than our expectation. Passive structure of EO decreases scope ambiguity - people tend to choose EO inverse rather than EO surface. Only passive structure of OE displays scope ambiguity.

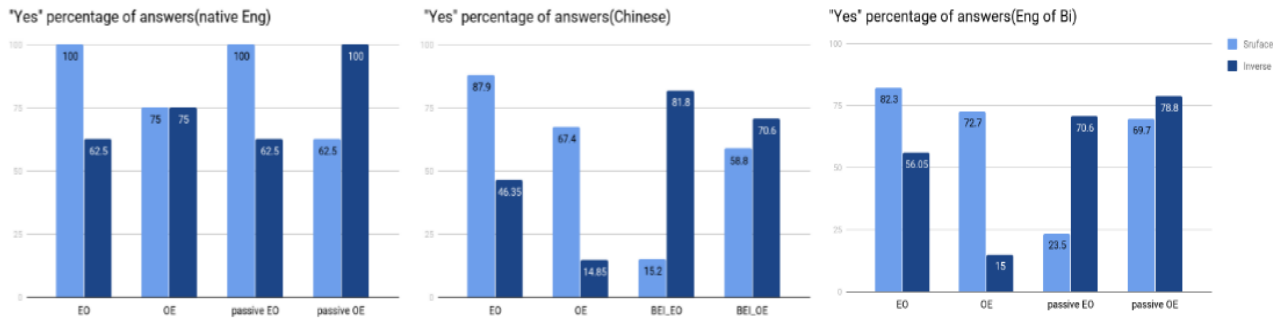


Figure 4.4 Comparison of results

Through comparison, it can be seen that English and Chinese native speakers have different understanding of scope ambiguity in their own language. Compared to general high ratio of English scope ambiguity interpretation, Chinese has much more surface interpretation than inverse, which proved the first hypothesis: Inverse version can be access but it is seldom allowed in Chinese while English has large scope ambiguity.

The second hypothesis is half right. In Chinese and English of bilingual speakers, only the scope ambiguity of passive OE is enlarged. We thought that it is “有” that enlarges the ambiguity of passive structure in OE. Passive EO begins with “有一條/個” which may restrict the meaning to “a certain one/a single one”(similar interpretation as “there is one..”) then EO_I is much higher than EO_S. Passive OE such as “每一條魚都被一條鯊魚抓住了” does not have this problem.

Taken together, results of English survey of Chinese bilingual speakers generally shows a similar distribution with native Chinese one. However, we still hesitated to give a conclusion. So we supplemented a survey of Chinese native speakers according to the comments of our presentation.

| | Surface | Inverse |
|---|---|---|
| EO | 93.75 | 56.25 |
| OE | 68.75 | 25 |
| passive EO | 12.5 | 50 |
| passive OE | 62.5 | 37.5 |

Table 4.5 Results of Chinese native speakers

No matter Chinese native speakers or bilingual speakers, the distribution of their interpretation is similar (though the ratio of passive structure is generally lower than those of Chinese bilingual one). So we can prove our third hypothesis, namely, English scope ambiguity interpretation of Chinese bilingual speakers will not be same as that of native English but will be relatively same as Chinese.

It is noticed that EO inverse of Chinese participants is higher than expectation. The reason is that inverse meaning entails surface meaning in EO (Scontras, Tsai, Mai & Polinsky, 2017). For example, Every shark attacked a pirate. If there is a single pirate that every shark attacked, then it's necessarily true that Every shark attacked a pirate. So OE is better for studying without entailment problem.

**5. Discussion**

In this part, the third hypothesis  and some interesting findings will be further discussed. First, the percentage of agreement on inverse readings is relatively higher than expectation. Besides, many Chinese participants reported that they felt confused when doing the questionnaire. But in our expectation, they should judge inverse interpretation as false without hesitation given to that Chinese speakers are not aware of scope ambiguity. What surprises us most is that a participant who has been living in America for a few years reported that double-quantifier Chinese sentences have scope ambiguity as well. He is surprised when knowing that it is not allowed in Chinese later.

Therefore, we make the hypothesis that English influences Chinese, and long-time exposing to English environment will cause the acceptance of scope ambiguity in Chinese. It is possible because double-quantifier sentences indeed have scope ambiguity in relative clauses. As we know, scope ambiguity is caused by GQ (generalized quantifier) movement. In Chinese simple sentence, some optional movement is blocked by an additional level of semantic tree. While in relative clauses, there is no such level and the movement is not blocked (WU, Liu, Liu, & Larson, 2017). Therefore, if the very same Chinese simple

sentence is put in a relative clause, the sentence will have scope ambiguity as well. So, it is reasonable to argue that Chinese speakers have the potential to see scope ambiguity in double-quantifier sentences.

However, this hypothesis has been proved to be false by a previous research. Researchers involve heritage Chinese speakers in America, who take Chinese as mother language and take English as domain language. They get the result that heritage Chinese speakers show prohibition of inverse reading in both Chinese and English (Scontras, Tsai, Mai & Polinsky, 2017). According to the principle of processing scope economy, speakers tend to accept surface structures and simpler grammars (Anderson, 2004). Therefore, participants will adopt Chinese grammar, which is without ambiguity and is simpler.

We thus make another hypothesis that the confusion mentioned above are caused by clues in the pictures. According to the stimulus control theory and a further argument, pictures can overshadow words(Wendt, 1956). Therefore, it is possible that participants analyze the picture and process the information it provides first then they judge if the sentence has the possibility to match such meaning. Also, as mentioned above, the very same sentence could be ambiguous in relative clauses. So, participants are likely to see the possibility of the invers readings, and our hypothesis is still true.

**6. Conclusion**

In conclusion, this is a study based on previous research of Scontras, Tsai, Mai, and Polinsky. Native English speakers, native Chinese speakers and bilingual speakers were involved. We try to prove that scope ambiguity is not allowed in Chinese, and this property of Chinese will transfer to the second language. Generally, our results are consist with the main hypotheses. By comparing the results, we find that English has large scope ambiguity while Chinese has smaller scope ambiguity, and passive structures will enlarge the scope ambiguity of some sentences in Chinese. Further experiments can also be done on why some bilingual speakers adopt the scope ambiguity, and whether the properties of nouns have influence on the processing of scope ambiguity.

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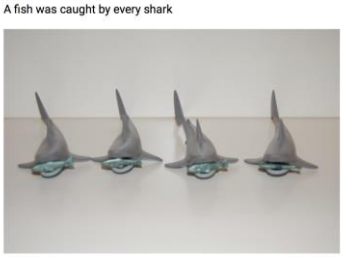
## Appendix 1

English stimuli

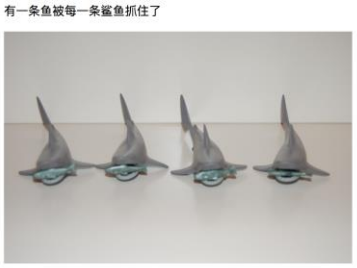
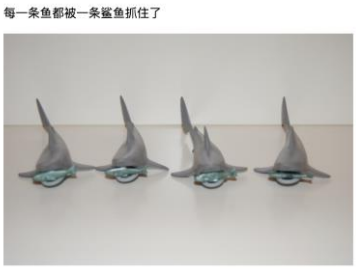
| | Surface | Inverse |
|---|---|---|
| EO active |   |   |

| | | |
|---|---|---|
| OE active |  |  |
| EO passive |  |  |
| OE passive |  |  |

**Appendix 2**

Chinese stimuli

| | Surface | Inverse |
|---|---|---|
| EO active |  |  |
| OE active |  |  |

| | | |
|---|---|---|
| EO passive |  |  |
| OE passive |  |  |

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