Does L2 learning influence cognition?:
Evidence from categorical and thematic organization of objects

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There is evidence in recent second language (L2) acquisition studies based on Cook's (1991) 'multi-competence' model that L2 learning influences cognition. This paper further examines its possible influence in terms of another cognitive domain, i.e., how L2 learners organize objects. In social psychology studies, it has been found that Westerners are inclined to organize objects based on categorical relations while Asians organize objects more on thematic relations. The main research question of the present study is whether L2 learning has any effects on these inclinations in organizing objects. The participants in the study were 34 Japanese learners of English, beginner and advanced, and 34 native speakers of English who have either some or no experience of learning Japanese. They were asked to perform a relational judgment task where they were presented with the target match, a categorical match and a thematic match and then were asked to decide how well the target went with each of the matches based on a five-point Likert scale. The results demonstrate that there are indeed certain differences in the relational judgment scores showing the possible cognitive influence of L2 learning on organizing objects. In spite of the differences in scores between different proficiency groups, these differences are not always statistically significant. After addressing some limitations of the present study, this paper concludes with the prospect that future research with more refined methodology will hopefully provide sound evidence to validate the findings in the present study.

1. Introduction

It has been claimed that the linguistic knowledge of a second language (L2) learner differs from that of a monolingual, who knows only one language (Cook 1991, 1999, 2003). This unique knowledge of the L2 learner has been called 'multi-competence' after Cook (1991, p. 103), which is defined as 'the compound state of a mind with two grammars' (Cook, 1991, p. 112). In discussing the so-called 'the multi-competence model' of L2 acquisition, it is claimed that the learning of a L2 can influence its learner's perception, cognition and thought which are different from those of the monolinguals. This leads back to the idea widely embraced in the 1950s and 1960s (Gentner & Goldin-
Meadow, 2003) that language influences perception, cognition and thought, generally known as the Sapir-Whorf hypothesis.

In recent years, experiments have been carried out to test and reinstate the Sapir-Whorf hypothesis (Kay and Kempton 1984) along with the development of more sensitive experimental methods (Gumperz & Levinson, 1996; Lin & Murphy, 2001). Adopting the methodologies in those experiments, L2 acquisition researchers started to examine whether any influence of L2 learning on cognition, after the acquisition of the first language, could be found or whether the learner’s cognition remains unchanged. Some experimental studies have already shown evidence that the learning of English by Japanese clearly reconstruct their perception and cognition (Athanasopoulos, Sasaki & Cook, 2004; Kasai & Takahashi, 2005; Athanasopoulos, 2006; Cook, Basseti, Kasai, Sasaki & Takahashi, 2006; Kasai, Takahashi, Hiramoto & Yamato, 2006). The aim of this study is to examine further the possible influence of L2 learning on the learner’s perception and cognition based on a new experimental framework inspired in experimental social psychology.

2. The study

2.1 Backgrounds

Nisbett (2003) reviewed some experimental studies to examine how Westerners and Asians organize objects and maintained that Westerners were inclined to organize objects analytically by attending to their features while Asians are much more inclined to organize objects holistically by considering the relations between the objects given. This difference in perception and cognition was detected in a study with English and Chinese speakers performing a 'grouping' task (Ji, Zhang & Nisbett, 2004). The English and Chinese speaking participants were presented with three cards with things categorically and thematically related, as Figure 1 below shows, and were asked to decide which goes best

![Diagram of Categorical and Thematic Relations](image-url)

Figure 1: Examples of Categorical and Thematic Relations (based on Ji, Zhang & Nisbett, 2004)
with the object in the center. The results revealed that English speakers grouped 'panda and cow' more often, which are categorically related as animals, while Chinese speakers more often grouped 'cow and milk', which are thematically (or contextually) related as the subjec-object relation, i.e., 'Cows produce milk.' This difference in organizing preference was found to be statistically significant.

However, Westerners' construction preference for categorical relations over thematic is somehow variable depending on the age of participants and the context where they perform a task. For example, Lin and Murphy (2001) conducted experiments to examine whether or not adult English speakers construct thematic categories in a certain context. Behind this research question is the commonly accepted claim that English-speaking children under age five construct thematic relations of objects while the primary basis of object sorting beyond age eight and in adults is on similarity or taxinomic category membership (Lin & Murphy 2001). The results in Lin and Murphy (2001) showed that adult English speakers' (over age 40) organizational judgment seemed to be influenced by thematic relations in a context where scenes and events were meaningful and salient.

On the other hand, some experimental studies have already shown a possible influence of L2 learning on perception and cognition. For example, Athanasopoulos, Sasaki and Cook (2004) found that among Japanese learners of English gradually came not to perceive the distinctions between 'Aō (blue)' and 'Mizuiro (literally the color of water)' and 'Midori (green)' and 'Kimidori (literally yellow green)' gradually receded as their English proficiency level advanced. Furthermore, Cook et al. (2006) reported that Japanese learners of English staying long-term in Britain paid more attention to the shape of objects than to their material composition compared to short-term stay Japanese. Yet Athanasopoula (2006) documented a finding that English learners of Japanese attended more to non-animate countable objects as their proficiency levels rose. These studies, among others, show the possible influence of L2 learning on cognition. However, no studies so far have been conducted to examine the effects of L2 learning on cognition in terms of categorical and thematic relations for organizing objects, animals or persons.

2.2 Method

This study, based on a study by Ji, Zhang and Nisbett (2004), was another attempt to examine whether or not L2 learning influences the learner's cognition, i.e., the way how the learner of a L2 organizes things.

i. Participants were 34 Japanese learners of English, 17 beginners (J-BE, their average age being 27) and 17 advanced learners (J-AD, their average age being 40). The beginners were either non-English-major freshmen or from non-English-related professional fields while the advanced learners were either English teachers in higher education or from
English-related professional fields. There were 34 native speakers of English, 16 living in Japan (E-LJ, their average age being 36) and 18 graduate students with no Japanese learning experience living in the UK (E-NJ, their average age being 24). All the participants were volunteered to participate in the experiment.

ii. A relation judgment task was adapted from Ji et al. (2004) and Lin and Murphy (2001), using 10 sets of cards with three names of objects on each. Some of the stimuli were chosen from the experiment by Lin and Murphy (2001), including those which can be easily found in both English and Japanese cultures and excluding those which were thought to be culturally biased like 'hamburger', 'igloo', 'Michael Jordan' and the like. Versions in both English and Japanese were prepared for the participants of the two language groups. The 10 sets of stimuli used in the present experiment are provided in Table 1, one target with a categorical and thematic match in each set. The categorical matches are those which are believed to be related to the targets at the same level of category (e.g., 'dog' and 'cat' belong to the same category as 'animal'). We considered that targets and categorical matches should share features at the same level. On the other hand, the thematic matches are those which are considered to be integral to people's concepts of the targets, or meaningfully and coherently related to the targets (Lin & Murphy, 2001). The arrangement of the matches on each card was randomized.

Table 1: Stimuli used in the present experiment

<table>
<thead>
<tr>
<th>Target</th>
<th>Categorical</th>
<th>Thematic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Monkey</td>
<td>Panda</td>
<td>Banana</td>
</tr>
<tr>
<td>2. Needle</td>
<td>Safety pin</td>
<td>Thread</td>
</tr>
<tr>
<td>3. Carrot</td>
<td>Eggplant</td>
<td>Rabbit</td>
</tr>
<tr>
<td>4. Teacher</td>
<td>Nurse</td>
<td>Homework</td>
</tr>
<tr>
<td>5. Dog</td>
<td>Cat</td>
<td>Leash</td>
</tr>
<tr>
<td>6. Bee</td>
<td>Butterfly</td>
<td>Honey</td>
</tr>
<tr>
<td>7. Pencil</td>
<td>Pen</td>
<td>Eraser</td>
</tr>
<tr>
<td>8. Airplane</td>
<td>Train</td>
<td>Pilot</td>
</tr>
<tr>
<td>9. Swimming</td>
<td>Golf</td>
<td>Swimming Pool</td>
</tr>
<tr>
<td>10. Cow</td>
<td>Pig</td>
<td>Milk</td>
</tr>
</tbody>
</table>

iii. The participants were presented with 10 sets of cards and, as the figure below shows, were asked to decide how closely the object (target) on top is related to the other two (matches) on each card in terms of a five-point Likert scale; 1 the weakest and 5 the strongest.
Before the participants performed the task, they completed a profile sheet that required information relating to age, native language, academic and professional background, study-abroad experience, living and learning experience in the target language country. After completing the sheet, participants were given brief instructions either in Japanese or English. Their task was to think about the object, animal or person in the center of the figure, then to decide how closely the other two names related to or went together with it. They marked which point they thought was appropriate for the organizational strength in each pair.

iv. The hypotheses of the present study are as follows:

1) There is a difference between English speakers and Japanese speakers in the strength of their judgments: English speakers organize categorically related objects more strongly while Japanese speakers organize thematically related more strongly.

2) There is a change in the judgments of Japanese speakers according to their English-proficiency level: the higher the English-proficiency level of L2 learners, the higher their scores for the categorical score.

3) There is a difference in scores among English speakers in terms of how familiar they are with Japanese.

2.3 Results

Figure 2 below shows the average scores of categorical and thematic relations for English and Japanese groups in total.

The mean score of categorical relation for Japanese speakers was 2.88 (SD = 1.18) and that for English speakers was 3.26 (SD = 1.02), which is much higher than the Japanese counterpart. The difference was also statistically significant ($t(678) = -4.53$, $p<.05$). On the other hand, the mean score of thematic relation for English speakers was 4.12 and for Japanese speakers was 4.40. Again, the difference between the two language groups was statistically significant ($t(678) = 0.38$, $p<.05$).
Secondly, the average scores among the four groups (J-BE, J-AD, E-LJ and E-NJ) were compared to see whether L2 learning, in this case English or Japanese, influenced the organizational judgment.

As Figure 3 shows, the mean scores of the categorical relation became higher along with the English proficiency level of Japanese speakers (J-BE: 2.78, J-AD: 2.98) and, in contrast, they became lower in terms of how much Japanese learning experience English speakers had (E-LJ: 3.15 and E-NJ: 3.37). A one-way ANOVA test on all the average scores for the four groups produced a statistically significant result ($F(3, 676) = 8.97$, $p < .05$). However, no significant results were found when comparing between the two groups (i.e., J-BE & J-AD, and E-LJ & E-NJ) as multiple comparison analysis shows in Table 2 below.
Table 2: Multiple comparison for categorical relations

<table>
<thead>
<tr>
<th></th>
<th>J-BE</th>
<th>J-AD</th>
<th>E-LJ</th>
<th>E-NJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-BE</td>
<td>0.21</td>
<td>0.37*</td>
<td>0.59*</td>
<td></td>
</tr>
<tr>
<td>J-AD</td>
<td>0.17</td>
<td>0.38*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E-LJ</td>
<td></td>
<td>0.22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<.05

As for the thematic relation, the score for advanced Japanese learners of English (J-AD = 4.48) was higher than that for Japanese beginners of English (J-BE = 4.32) while the score for English speakers living in Japan (E-LJ = 3.94) was much lower than that for English speakers with no Japanese learning experience living in UK (E-NJ = 4.28). Again, a one-way ANOVA test was performed on all the average scores for the four groups and the results were statistically significant ($F(3,676) = 8.92, p<.05$). Yet, as Table 3 shows, no statistically significant difference was found between the scores for the Japanese groups, J-BE and J-AD, while the difference between the English groups, E-LJ and E-NJ, was statistically significant. These results are shown in Table 3.

Table 3: Multiple comparison for thematic relations

<table>
<thead>
<tr>
<th></th>
<th>J-BE</th>
<th>J-AD</th>
<th>E-LJ</th>
<th>E-NJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>J-BE</td>
<td>0.15</td>
<td>0.38*</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>J-AD</td>
<td></td>
<td>0.53*</td>
<td>0.20</td>
<td></td>
</tr>
<tr>
<td>E-LJ</td>
<td></td>
<td></td>
<td>0.33*</td>
<td></td>
</tr>
</tbody>
</table>

*p<.05

3. Discussion

Each of the hypotheses of the present study is discussed below.

Hypothesis 1:

There is a difference between English speakers and Japanese speakers in the strength of their judgments: English speakers organize categorically related objects more strongly while Japanese speakers organize thematically related more strongly.

The results clearly supported the first hypothesis in that English speakers preferred more to the categorical relation than Japanese speakers, and Japanese speakers more to the thematic relation than English speakers, and both differences were statistically significant.
Hypothesis 2:

There is a change in the judgments of Japanese speakers according to their English-proiciency level: the higher the English-proficiency level of L2 learners, the higher their scores for the categorical score.

Even though the difference in organizational preference between the two Japanese groups was not statistically significant, as Figure 3 showed, some difference did exist between them. However, in this case, the preference scores headed in a reverse direction as had been predicted. That is, as the English-proficiency level became higher, the Japanese learners were more inclined to toward the thematic preference. The reason of this phenomenon is not clear. Therefore, further empirical study would be needed to pursue this issue with different subjects and methodology.

Hypothesis 3:

There is a difference in scores among English speakers in terms of how familiar they are with Japanese.

As the result showed, this hypothesis was supported. However, as in the case of the thematic relation for the Japanese learners of English, Japanese learning experience seems to influence on lesser preference of thematic relation.

The results relating to Hypotheses 2 and 3 maintain that a logical prediction, 'the higher the L2 proficiency of the learner becomes, the closer his/her cognition or the way he/she organizes things and objects to that of the native speaker of the target language,' is not held to be true. However, this does not negate the possible influence of learning a L2 on a person's cognition because the language-learning influence can be headed in both directions, as depicted in Figure 4 below.

In learning a L2, a person acquires a compound knowledge of two languages and accordingly his/her cognition changes into the one which is quite different from his/her language and that of the target language speaker. This correlates well with the idea of the multi-competence model (after Cook, 1991) saying that L2 learners are unique and very distinctive in the domain of cognition influenced by learning a L2.

4. Conclusion

The main findings of the present study are as follows:
1. There were statistically significant differences in both categorical and thematic relations between Japanese learners of English and English native speakers as a whole. Thus, the results do provide further evidence that Westerners tend to construct objects categorically while Asians thematically.
2. Though significant differences in judgments of categorical relations among the four groups were found, no statistically significant difference was found between the same language groups. As far as the present results on the categorical relation are concerned, it is not conclusively clear as to whether the level of L2 proficiency makes a difference or not.

3. Significant differences in decisions of thematic relations among the four groups were found. While no statistically significant difference was found between the Japanese groups, there was a significant difference between the English groups. Again, there is no clear answer to the question of whether the L2 proficiency level makes a difference as to the thematic relation of objects.

Yet there are some obvious limitations in the present study. Firstly, we used the names of objects on cards as stimuli. This might have led to the inconsistent results in the relationships between the proficiency level of L2 and both categorical and thematic relations. Using pictures instead to give participants, especially young children, clearer images of objects and items in question could address this issue.

Secondly, there were large gaps in age among groups, 27 years old for J-BE, 40 for J-AD, 36 for E-LJ and 24 for E-NJ. As Lin and Murphy (2001) have shown, there have been many experiments to show the vital factor of age on category construction and cognition. Therefore, to avoid this bias, using participants of around the same age to perform the experiment is advisable.

Thirdly, categorizing beginner or advanced groups was not based on an objective measure. Therefore, there could be those whose proficiency was much higher than expected in the beginner group. Thus adopting a normalized language test to decide participants'
proficiency levels is also advisable.

However, these limitations do not necessarily diminish what was found in the present study. The results here do suggest that L2 learning does influence cognition or certainly seems to influence cognition in some ways. Further empirical studies in other cognitive domains need to be conducted with new and appropriate methodologies to obtain more evidence to support the idea of multi-competence, which would hopefully help to validate the findings in the present study.

(This is a revised version of the paper read by MURAHATA Yoshiko at the 33rd Annual Convention of the Japan Society of English Language Education in Oita on 5th of August, 2007.)

References


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