

## **Congruent and incongruent metaphorical sentences processing in discourse:**

### **A reaction time study**

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### **Abstract**

This study investigates the role of conceptual mappings in metaphor interpretation in discourse. In particular, we examine whether conventional metaphors that share congruent conceptual mappings with the prior context have significantly higher appropriateness rating scores and reading times as compared to ones that don't have consistent conceptual mappings with the prior context. In addition, novel metaphors are tested to see whether they have the slowest reading time and the lowest rating scores for appropriateness because of their level of novelty.

We found a metaphorical congruency effect in an off-line rating task but a lack of the congruency effect in an on-line reading task. Our results are consistent with the English metaphorical idiom studies as Nayak and Gibb's (1990) off-line rating study, as well as Glucksberg et al's (1993) on-line reading study. Our study suggests that conceptual mappings are activated when subjects are asked to rate the appropriateness of a final sentence in discourse, but not when they are simply asked to read.

**Keywords:** Conventional metaphors, conceptual mappings, novel metaphors, metaphorical congruency effect

## Introduction

In recent decades, conceptual metaphors have been intensively examined in the literature (Coulson 1996, Fauconier & Turner 1998, Grady, Taub & Morgan 1996, Kovecses 1986, Lakoff 1993, Lakoff & Johnson 1980, Shen & Balaban 1999, Sweetser 1990). From a processing perspective, researchers' attempts to investigate how metaphors are interpreted have led to two different approaches -- the conceptual metaphor view (Ahrens 2002, Coulson & VanPetten 2002, Nayak & Gibbs 1990) and the attributive categorization view (Glucksberg et al. 1997, Keyar et al. 2000, McGlone 1996). The conceptual metaphor view proposes that metaphors are instantiations of conceptual mappings that are understood via mapping source/concrete domains to target/abstract domains. On the other hand, the attributive categorization view proposes that people don't rely on conceptual mappings to interpret metaphors. Instead, metaphors are comprehended via class-inclusion assertions, in which a topic is assigned to a category (i.e. a property). However, the question of which account better explains how metaphors are understood is still controversial.

The conceptual metaphor view proposes that conceptual mappings play a role in metaphor understanding in discourse. This view predicts that metaphorical expressions with congruent (i.e. consistent) mappings to the prior context are interpreted more easily and effortlessly than ones with incongruent (i.e. inconsistent) mappings to the prior context. Several idiom (Nayak & Gibbs 1990, Gibbs 1994) and metaphors (Allbritton et al 1995, Kemper 1989) studies have shown evidence for the congruency effect in discourse in off-line rating and on-line priming and reading experiments. However, the attributive categorization approach does not predict a metaphorical congruent effect in discourse. Evidence is the lack of the congruency effect in RTs and ratings comparing congruent and incongruent metaphors (Glucksberg, Brown, & McGlone 1993, Keysar & Bly 1999, Keysal et al 2000, McGlone 1996).

The Nayak & Gibbs (1990) idiom study showed evidence that conceptual mappings affect idiom interpretation in discourse. For example, when a person was described as "fuming", this expression seemed to be consistent with "blew one's top". Both of the expressions are related to the instantiation of the metaphor ANGER IS HEAT IN A PRESSURIZED CONTAINER. Nayak and Gibbs' (1990) ran an off-line appropriateness rating task and examined the metaphorical congruency effect in idiom comprehension. They wanted to see whether people unconsciously made reference to conceptual mappings in idioms interpretations when contexts were biased. Subjects were presented with short scenarios as shown in (1) and (2) and rated how appropriate the target sentence was to their corresponding prior context on a 1-7 scale.

**(1) ANGER IS A FEROCIOUS ANIMAL**

*Mrs. Simmons is a bear about cleanliness. Her house is always sparkling clean. She's always prowling around the house with a duster in her hand. She attacks every spot of dust like a personal enemy. It's not easy on her kids. She watches them like a hawk to see whether they make a mess. The moment they become a little careless, she*

- a. *bites their heads off* (metaphorical congruence)
- b. *blows her top* (metaphorical incongruence)

**(2) ANGER IS HEAT IN A PRESSURIZED CONTAINER**

*Mrs. Simmons is a stickler for cleanliness. She is always very tense when she is cleaning her house. It makes her fume when her family does not cooperate. She gets hot every time she finds another dusty spot. The pressure really builds up when she is cleaning her kids' rooms. Her tolerance of their untidiness really reaches its limits. And when they walk in carelessly with muddy feet, she*

- a. *blows her top* (metaphorical congruence)
- b. *bites their heads off* (metaphorical incongruence)

In Example (1), the results showed that the first idiom "bites their heads off" was rated significantly more appropriate than the idiom "blows her top". The two idioms were instantiations of two different conceptual metaphors. The first idiom "bite their heads off" was an instantiation of ANGER IS A FEROCIOUS ANIMAL, and the second "blow her top" was an instantiation of ANGER IS HEAT IN A PRESSURIZED CONTAINER. With the lexical cues from the scenario such as "bear", "prowling", "attack", and "hawk", readers may unconsciously refer to the conceptual metaphor ANGER IS A FEROCIOUS ANIMAL and rate the idiom "bite his head off" more appropriate since it shares the congruent conceptual metaphor ANGER IS A FEROCIOUS ANIMAL with the prior context. The idiom "blow her top" was rated less appropriate since its underlying conceptual metaphor was different from the prior context.

However, when given the scenario in Example (2), people rated the idiom "blows her top" significantly more appropriately than the idiom "bits their heads off". Readers may make reference to the conceptual metaphor ANGER IS HEAT IN A PRESSURIZED CONTAINER with the help of lexical cues such as "tense", "fume", "pressure builds up", and "reach its limits". Thus, when they rated these two idioms, "blows her top" was more appropriate than "bites their heads off" since the former was an instantiation of the congruent metaphor. They concluded that the appropriate congruency effect in discourse was evidence for conceptual mappings being used and accessible in idiom interpretation.

In contrast, Glucksberg, Brown, and McGlone's (1993) idiom study supports the attributive categorization approach. They didn't find the congruency effect occurring in an on-line reading task when they re-ran Nayak and Gibbs' (1990) study. Their experimental results showed that reading time for the congruent condition was not significantly different from the incongruent condition, which they interpreted to mean that conceptual mappings did not underlie metaphor interpretation.

These previous studies have focused almost exclusively on idiomatic expressions. However, understanding idioms may not require the use of conceptual mappings because they are already fixed lexical expressions. However, we hypothesize interpreting conventional expressions such as "He is known for his many rapid conquests" entails the use of the mappings of LOVE IS WAR. In addition, there is currently little research at a discourse level concerning the reaction time in comprehending metaphorical sentences in Mandarin Chinese. In this study, we investigate which metaphor approach, i.e. the conceptual metaphor view or the attributive categorization view, better explains Mandarin conceptual metaphor understanding in discourse. In particular, we would like to know what role conceptual mappings play in metaphor interpretation in discourse. If we find the metaphorical congruency effect exists in Mandarin metaphor discourse when metaphorically congruent metaphors are compared with incongruent and novel metaphors in both the on-line and off-line task, the conceptual metaphor approach will be supported. If we find a lack of the congruency effect in both tasks, the attributive categorization view will be supported.

### **Experiment 1: Off-line Appropriateness Rating Task**

We hypothesize that conceptual mappings can motivate Mandarin conceptual metaphor interpretation in discourse. In this experiment, the metaphorical congruency effect in discourse is expected in this off-line rating task. Therefore, we predict that metaphorically incongruent metaphors have significantly lower rating scores for appropriateness as compared with congruent ones.

#### *Participants*

Twenty-one subjects participated in this off-line appropriateness task. All of them were the undergraduate students of National Taiwan University and were native speakers of Mandarin.

#### *Stimuli and Design*

Two conditions were looked at in this off-line task: (1) the metaphorically congruent

condition and (2) the metaphorically incongruent condition. Both of the conditions were the conventional metaphors. However, their difference is in the mapping congruency between contexts and targets. That is, the metaphorically congruent metaphors were materials in which the prior context shared consistent conceptual mappings with its terminal target metaphorical expression; the metaphorically incongruent metaphors were materials in which the prior context shared inconsistent conceptual mappings with its correspondent terminal expression.

Thirty sets of materials were created. An example is given in (3). In this scenario, the underlying conceptual metaphor is BRAIN IS MACHINE. The target domain BRAIN is conceptually mapped to the domain MACHINE. The mapping is linguistically realized via four lexical items: 精密 *jing-mi* "delicate", 機器 *ji-qi* "machine", 生鏽 *sheng-xiu* "to rust", and 運轉 *yun-zhuan* "function". Two conditions were designed in the terminal sentences. The lexical word 故障 *gu-zhang* "break down" in the metaphorically congruent condition reflects the metaphor IDEA IS BUILDING which is consistent with the previous context. On the other hand, the lexical word 衰退 *shuai-tui* "to degenerate" in the metaphorically incongruent condition reflects the metaphor BRAIN IS MACHINE, which is inconsistent with the previous context.

### (3) BRAIN IS MACHINE

#### Context

我們的大腦是一座精密的機器如果長久沒有動腦一定會生鏽所以一定要經常做一些腦力激盪的活動 我們的大腦才會運轉順利

*Our brain is a delicate machine. If it is not used for a long time, it will rust. Therefore, we have to often brainstorm, so that our brain can operate smoothly.*

#### Targets

Congruent: 越常思考我們的大腦越不容易故障

*The more we use our brain, the more our brain won't break down.*

Incongruent: 越常思考我們的大腦越不容易衰退

*The more we use our brain, the more our brain does not degenerate.*

The length for the paired terminal sentences was controlled. The average length was 23.7 characters (SD = 5.6), ranging between 15 and 36 characters.

In order to control the acceptability level of the paired terminal sentences, our sixty stimuli were pre-tested in an acceptability rating task. The congruent and incongruent paired sentences were rotated and distributed between two lists. Forty undergraduate students

(twenty subjects for each list) were instructed to rate thirty terminal sentences with an equal number of fillers as "very acceptable" or as "not acceptable" on a scale of 1 (low acceptability) to 7 (high acceptability). Ratings from thirty-six subjects were computed (four subject data were removed because of missing data in their questionnaire). The results showed that the congruent metaphors and the incongruent ones had average ratings of 6.17 (SD = 1.26) and 6.11 (SD = 1.33), respectively. A t-test showed that the congruent metaphors did not have significantly higher rating scores than the incongruent ones ( $t(1078) = 1.27, p > .05$ )

In this off-line appropriateness rating task, sixty materials were rotated among four lists. Each list contained fifteen contexts with target sentences randomly ordered. In each list, half the stimuli were congruent metaphors and half the stimuli were incongruent ones. Subjects only saw each set of stimuli once.

### *Procedure*

Twenty-one subjects were randomly assigned to one of the four lists. Subjects were instructed to read each sentence carefully and judge whether the terminal metaphorical sentence was appropriate or not to the whole given context on a 1-7 point scale. The 1 point referred to 不適當 *bu-shi-dang* "inappropriate" and the 7 points referred to 很適當 *hen-shi-dang* "appropriate". After reading each paragraph carefully, subjects circled their rating directly in the questionnaire list. The task took approximately 15 minutes.

### *Results & Discussion*

In order to balance the number in each list, one subject was removed. Data from twenty subjects were computed. The average ratings of the conventional metaphorical congruent and conventional metaphorical incongruent conditions are 5.26 (SD = 2.1) and 4.27 (SD = 2.0), as shown in Figure 1. The metaphorically congruent condition had the significantly higher rating scores than the metaphorically incongruent condition ( $t(298) = 2.56, p < .05$ ).

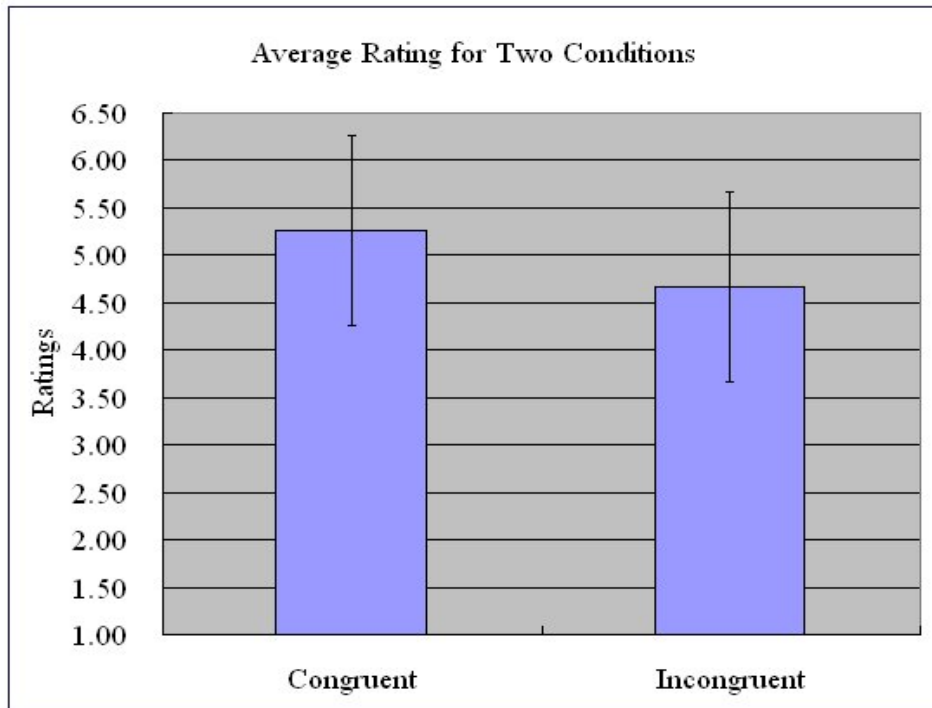


Figure 1: Metaphorical congruence rating scores of the congruent metaphors and incongruent metaphors

Our finding is consistent with Nayak & Gibbs' (1990) off-line appropriateness rating study. When subjects read the contexts, conceptual mappings were activated to facilitate metaphor comprehension. In contrast, when the target sentences didn't have consistent conceptual mappings with the prior contexts, congruent mappings interfered with metaphor interpretation. Evidence is the significant difference in rating scores between the congruent and incongruent conditions in this off-line study. In brief, the presence of the congruency effect in our study suggests that conceptual mappings can motivate metaphor interpretation in discourse.

### Experiment 2: On-Line Reading Task

In this experiment, the metaphorical congruency effect in on-line discourse is also expected in the on-line reading task. In the on-line reading experiment, we predict that that the metaphorically incongruent metaphors will take longer to read than the metaphorically congruent metaphors.

In addition, compared with congruent and incongruent metaphors, novel metaphors are used in this experiment. They are predicted to be the slowest among the three types of metaphors.

### *Participants*

Thirty-eight undergraduate students of National Taiwan University were paid NT100 to participate in this experiment. All of them were native speakers of either Mandarin or Taiwanese.

### *Materials and Design*

In this on-line reading task, the materials were adopted from off-line experiment. In addition to the two conditions, i.e. the metaphorically congruent and incongruent metaphors, a third condition, the novel metaphors, was included. They were novel metaphors which did not follow any conceptual mappings between pairs of abstract-concrete domains (Ahrens 2002) and were inconsistent with conceptual mappings of the prior contexts. For example, LOVE is often metaphorically described as FOOD, such as 他嚐過愛情的滋味 "He has tasted the flavor of love" and 我倆的愛情很甜蜜 "Our love is very sweet". Based on the linguistic data such as 嚐過 "taste", 滋味 "flavor" and 甜蜜 "sweet", the conceptual mapping for LOVE IS FOOD which has to do with "taste" is postulated (Ahrens 2002). However, this metaphorical expression "她正在消化他們倆的愛情" is novel because the conceptual mapping for LOVE in this expression is related to "digestion", instead of "taste". Therefore, the conceptual mapping "digestion" in the novel sentence is not consistent with the conceptual mapping "taste" for LOVE IS FOOD. Readers will judge this type of metaphors as odd expressions. In brief, the materials in this task were three conditions: the metaphorically congruent metaphors, the metaphorically incongruent metaphors, and the novel metaphors that don't follow the same-target domains mapping principle.

For example, in the following scenario, the underlying conceptual metaphor is IDEA IS A BUILDING. The target domain IDEA is conceptually mapped to the domain A BUILDING. The mappings are linguistically realized via four lexical items, such as 規劃 *gui-hua* "draw up", 設計圖 *she-ji-tu* "designed map", 建立 *jian-li* "to build up" and 雛型 *chu-xing* "a model". Three conditions were designed in the terminal sentences. The lexical word 構築 *gou-zhu* "construct" in the metaphorical congruence condition reflects the metaphor IDEA IS A BUILDING that is consistent with the one in the previous context. Furthermore, the lexical word 推銷 *tui-xiao* "promote" in the metaphorically incongruent condition reflects the metaphor IDEA IS COMMODITY which is inconsistent with the previous context. Finally, the lexical word 裝潢 *zhuang-huang* "to decorate" in the novel condition was used. This expression is unfamiliar and does not follow the conceptual mapping for IDEA IS A BUILDING, which has to do with "structure" (Ahrens 2002).

#### (4) IDEA IS A BUILDING

##### Context

要撰寫一個好的研究計畫書，首先要規劃出一個完整的設計圖，且要能清楚呈現研究的重點，包括相關研究文獻、議題及動機等等，然後建立正確研究的方法與步驟。這樣整個計畫的雛型也就大概出來了。

*When you write up a good research proposal, you first have to plan a complete design map. In addition, you have to clearly present the research points, including the literature review, the research questions, the motivation, etc. Then, you have to build up the correct research methods and steps. In this way, the model of your proposal will be complete.*

##### Targets

Congruent: 所以要構築自己的論點及方案並不難。

*So, it is not difficult to construct your own theory.*

Incongruent: 所以要推銷自己的論點及方案並不難。

*So, it is not difficult to promote your own theory.*

Novel: 所以要裝潢自己的論點及方案並不難。

*So, it is not difficult to decorate your own theory.*

Eighteen sets of materials were created concerning the topics such as love, politics, ideas, mind and business. In addition, the lexical items were controlled for co-occurrence frequency with their corresponding contexts, word frequency, syntactic categories and position in the sentences across the three conditions. To avoid the semantic priming effect triggered by associated linguistic words, any co-occurrence frequency between the target lexical words and these contextual lexical words was removed. We used the Sinica Balanced Corpus (Version 4) on the Internet (<http://www.sinica.edu.tw/SinicaCorpus/>) to control the collocation between the target and the context lexical words. All of the mutual information values were zero for a lexical window plus or minus ten words, which suggest that the target lexical words never co-occurred with their corresponding contextual lexical words.

In addition, word frequency across the three conditions was also controlled (the Sinica Balanced Corpus, Version 4). The means of the word frequency among three conditions were 42.9, 43.6 and 42.5 characters, respectively. Finally, the target lexical words in the target sentences were place in the middle of the sentences instead of at the end of the sentences in order to avoid wrap-up effects.

The average length for the target sentences in three conditions was 20.1 characters (SD = 3.8), ranging between 16 and 28 characters. Furthermore, the average length of the

contexts was 62.3 character (SD 14.9), ranging between 32 and 90 characters.

In order to control the terminal sentences for their conventionality and acceptability, these eighteen sets of three conditions were pre-tested in a off-line acceptability rating task. The three target conditions were rotated among three lists. Twenty-eight undergraduate students were instructed to rate the three conditioned sentences. They rated the materials on a scale of 1-7, 7 being highly acceptably and 1 not acceptable. The results showed that the target sentences across three conditions had the average ratings of 5.2 (SD = 0.7), 5.0 (SD = 0.5) and 3.8 (SD = 0.6). An one-way ANOVA test showed the significant difference in rating scores among three conditions ( $F(2, 51) = 27.915, p < .05$ ). The planned comparison t-test showed that the metaphorically congruent metaphors were not rated significantly higher than the incongruent ones ( $t(34) = 0.895, p > .05$ ) but the rating scores for the metaphorically congruent and incongruent metaphors were rated significantly higher than the ones for the novel ones ( $t(34) = 6.405, p < .05, t(34) = 6.803, p < .05$ ), as expected.

Eighteen sets of materials were rotated among three lists. Subjects only saw one of the story conditions. Each list contained eighteen experimental items with an equal number of filler examples (i.e. eighteen items). These fillers were adopted from articles or news on the internet. They were close derivations of the experimental items, and concerned the topics such as love, politics, mind, etc.

In brief, each list contained thirty-six materials, eighteen experimental items and eighteen filler items. The order of thirty items in each list was randomly organized.

### *Procedure*

The subjects were randomly assigned to one of the three randomized counterbalanced lists. The subjects were seated in front of a Acer computer at a comfortable reading distance with the dominant hand resting on one of buttons on the button box in front of them. The stories were presented line by line at the center of the screen in fourteen fonts. Each sentence had no more than 30 characters.

The subjects were instructed to read a number of short stories, each about a paragraph long. They saw these stories appear on the screen one sentence at a time, at a pace that they determined. At the beginning of a story, the word 預備 *yu-bei* "Prepare" appeared on the screen. When subjects were ready, they pressed the button and a line appeared. At the end of the sentence, 短文結束 *duan-wen jie-shu* "The end of the story" appeared at the center of the screen. They were told to read the stories at a quick pace, but were not supposed to move to the next line until they understood the meanings of each line. They were also instructed that once they moved to a line, they would not be able to backtrack to any previous line.

In the whole experiment, subjects encountered eighteen filler stories. After six of the filler stories were read, they answered a true/false question concerning the contest of the

preceding story. These questions were included to ensure that the subjects read for comprehension. After answering a question, the subjects pressed the button to read the next story. On the average, the subjects took approximately twenty-five minutes to complete the experiments.

Reading times for each line were measured from the onset of the line to the button press for moving to the next line.

### *Results and Discussion*

Thirty-eight subjects were run in this on-line reading task. All of subjects got at least 83% correct answers (i.e. at five correct answers out of the six comprehension questions). The data of five of subjects were removed because some of them did not fit our requirements (i.e. undergraduate students), some were interrupted by cell phone ringing and machine problems during the experiment. There were thirty-three participants with reliable data, eleven participants for each list. All of data from the thirty-three subjects were computed and analyzed.

The mean reading time for the metaphorically congruent metaphors, the metaphorically incongruent metaphors and the novel metaphors was 2476 (SD = 759), 2546 (SD = 805), 2915 (SD = 1042) ms, respectively.

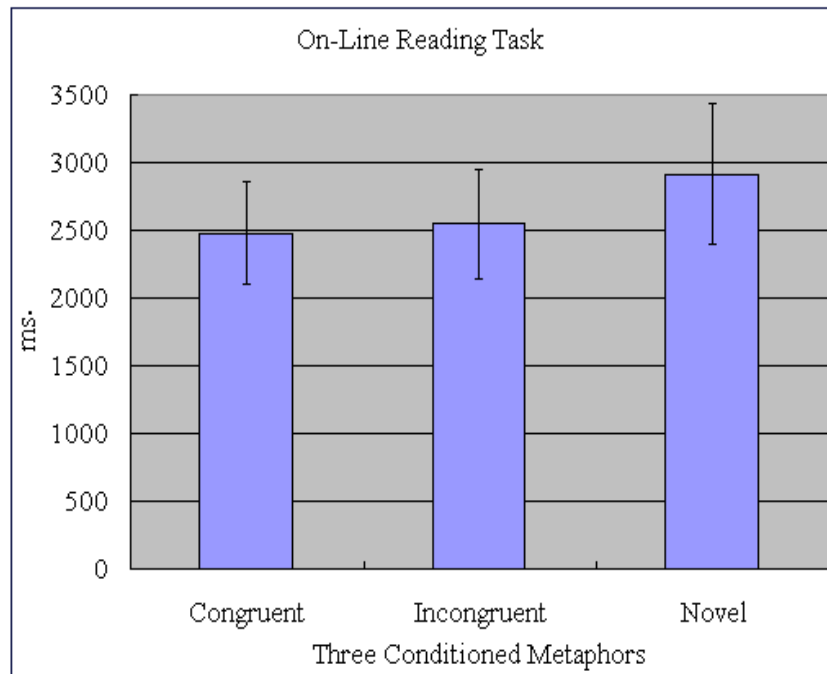


Figure 2: Means of the reading times across the metaphorically congruent metaphors, metaphorically incongruent metaphors and novel metaphors.

An one-way ANOVA was run to test the reading times across the three conditions. There was an overall significant main effect in reading times among three conditions ( $F(2,591) = 6.401, p < .05$ ). Of major importance to the hypothesis under investigation, *a priori* planned comparison of the three conditions was performed on the metaphor type (congruent, incongruent, novel). The t-test analysis showed that reading time for the metaphorically congruent metaphors was not significantly faster than one for the metaphorically incongruent metaphors ( $t(389) = -0.592, p > .05$ ). However, reading time for the novel metaphors was significantly slower than one for the other two types of metaphors. Reading time for the novel metaphors was significantly slower than one for the metaphorically congruent metaphors ( $t(389) = -3.241, p < .05$ ); reading time for the novel metaphors was also significantly slower than one for the metaphorically incongruent metaphors ( $t(389) = -2.617, p < .05$ ). To conclude, our finding was consistent with Glucksberg et al.'s (1993) study on English idioms in discourse interpretation. The lack of the metaphorical congruency effect for conventional metaphors in the on-line reading task suggests that conceptual mappings for conventional metaphors are not activated in discourse comprehension. However, there was an effect for novel metaphors.

### **General Discussion**

The results in the off-line rating task demonstrate the presence of the conceptual metaphors and suggest that conceptual mappings are used during metaphor interpretation. This finding is consistent with Nayak and Gibbs' (1990) idiom study, which supports the conceptual metaphor view. However, the results in the on-line reading task shows a lack of the metaphorical congruency effect for conventional metaphors, which suggests that people didn't rely on conceptual mappings during metaphor understanding. This finding is consistent with Glucksberg et al's (1993) idiom study, which supports the attributive categorization view that the conceptual mappings may not be accessed.

How do we account for the conflicting results? There are at least three possible reasons. The first possible reason has to do with task demands. Subjects in the appropriateness rating were instructed to rate the conceptual metaphors as appropriate or not. In contrast, subjects were instructed to simply read the material instead of doing an appropriateness judgment in the on-line task, in which subjects were not aware of the purpose of the task. Perhaps if the on-line study asked subjects to interpret the target sentence as appropriately or not for the prior contexts, we would find the metaphorically incongruent metaphors took longer response time than the congruent ones.

The second possible reason might be that the conceptual mappings are available but not essentially and automatically accessed time on-line. It may be that conceptual mappings require sufficient time to be activated. So in the off-line rating task, subjects had more time

to reanalyze the contexts and acquired the metaphorical reading within the stories. Subjects, in the off-line reading tasks had to instead read each line as quickly as they can so as to understand the whole sentences. Under constrained time pressure, conceptual mappings are not activated.

The third possible reason may be due to the conventionality of metaphors. Even though there was no significant difference between the two types of conventional metaphors, i.e. congruent and incongruent ones, the novel metaphors took the longest time in interpretation in the reading task. In other words, the conventional metaphorical expressions act like "fixed expressions". The congruency factor for the prior contexts didn't affect reading time for these fixed expressions. In Keysar, Shen and Horton's (2000) study, they found that conceptual mappings were only accessed when subjects read novel metaphors rather than conventional ones. Conventional stories that were expressed with an explicit conceptual metaphor were not read significantly faster than ones that were not expressed with an explicit one in an on-line reading time task. However, the novel metaphorical expressions were read significantly slower than the conventional ones. They concluded that the unstable context effects were evidence that people did not use conceptual mappings when reading conventional metaphors. In contrast, people use such conceptual mappings when reading novel ones.

In addition, our finding that novel metaphors took the longest among three types of metaphors could have to do with whether metaphors follow conceptual mappings or not (Ahrens 2002). That is, our congruent and incongruent target sentences were both conventionally metaphorical expressions that follow conceptual mappings while our novel metaphors were unfamiliar expressions that do not follow any existing conceptual mappings. However, our results may be confounded with the factor: different levels of acceptability. The results of the acceptability rating test showed that the congruent, incongruent and novel metaphors had the average rating scores of 5.2, 5.0 and 3.8, respectively. It may be argued that the differences in the reading times between congruent/incongruent and novel metaphors could be due to their significant differences in the level of acceptability. If *a priori* reading times for the target sentences in three conditions were tested and showed that reading times for the three metaphors had no significant difference, this confounding factor would be removed.

To conclude, we find the conceptual mappings are activated in the off-line appropriateness rating task but not in an on-line reading task. The conflicting results can be attributive to three possible reasons, i.e. task demand, time pressure and conventionality of metaphors. The issue of whether, conceptual mappings are activated during the conventional metaphors being read is still not clear. So far, we can not prove which metaphor approach, i.e. the conceptual metaphor view or the attributive categorization view, better explains how metaphors are interpreted and comprehended.

In the future, we will run a study to control *a priori* RTs for each target sentence. In addition, we are going to examine whether the lack of the congruency effect is due to task demand. An on-line interpretation task will be conducted. If we find the congruency effect in the on-line appropriateness task, this will support the hypothesis that conceptual mappings can be activated on-line. Furthermore, we did not test novel metaphors that follow conceptual mappings in these current studies. We predict following (Ahrens 2002) that novel metaphors that follow mapping principles should be understood faster than novel metaphors that don't follow mapping principles when following a preceding discourse, once *a priori* reading times have been controlled. Finally, even though we didn't find the congruency effect between the metaphorically congruent and incongruent metaphors in RT experiment, we will wonder whether we find the significant difference in N400 between the two groups in an ERP experiment since N400 is a good index for semantic expectancy (Coulson & VanPetten 2002). If metaphorically congruent metaphors elicit larger N400 than incongruent ones, these results will support the postulation that conceptual mappings are activated in discourse.

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