

The Strength of Source in Predicative Metaphor Comprehension

Lam Wing Yin The University of Hong Kong, Hong Kong SAR Zhou Dehui Ruth Hong Kong Shue Yan University, Hong Kong SAR

The purpose of the study was to investigate the characteristics of predicative metaphors and its comprehension way. Past literatures revealed that conventionality and aptness of metaphors influenced metaphor comprehension. In this research, it proposed a new concept called typicality of the source to classify the predicative metaphors. The idea of the typicality referred to the strength between the vehicle and its source. Typicality between the hidden source and its matched verb used might relate to the long-term memory and comprehension speed. The typicality of the source measured how representative the verb was for the implicit source. For instance, we were able to claim that "to fly" was the key feature of "bird", but we could not say that "to boil" was a typical feature of "water". This research contained two experiments. The first experiment was the rating tests in which the purpose was to find suitable Chinese predicative metaphors and classified them into groups according to aptness and typicality. The second experiment was to test the recalling numbers of metaphors, comprehension reaction time, and accuracy of the predicative metaphors. The result revealed aptness had the main effect and typicality had interaction effect with priming. This suggested the predicative metaphors might have a chance to process through the vehicle's source.

Keywords: metaphor comprehension, predicative metaphors, nominal metaphors, categorization, blending, target, vehicle, cognition

Introduction

In the past, metaphor was considered as a rhetoric device for illustrating or hiding the author's reflection, mood, intention, or reasoning in literature or linguistics (Kovecses, 1988; Lakoff & Johnson, 2003; Reddy, 1979; Sweetser, 1990). The unique feature of metaphor was that different from the literal statement comprehension ways, it could not be understood simply by top-down or bottom-up processing. The reason was rested on the non-semantic establishment between the idea and the correspondent use of disparate domain for attribution (Bowdle & Gentner, 2005). The concept referred to become implicit and more abstract. According to Lakoff and Johnson (2003), metaphor was "a matter of extra-ordinary rather than ordinary language" (p. 8), showing that it had higher language power than we expected in our daily lives. Alternatively, anything that did not include extensive abstract thinking or was closer to concrete physical experience was literal (Lakoff, 1993). For example, "The dog is on the sofa" was not metaphorical, but literal. In "The dog is a lion while barking", the fierce characteristic of a lion had been projected onto the dog in which the sentence became metaphorical. Another example, "She guided me

Lam Wing Yin, M.Ed., Faculty of Education, The University of Hong Kong, Hong Kong SAR.

Zhou Dehui Ruth, Ph.D., associate professor, Department of Counselling and Psychology, Hong Kong Shue Yan University, Hong Kong SAR.

to overcome the hardship", portrayed the life road as a difficult path with the inferring concept hidden and this metaphorical expression was related to love and caring. It was noticeable that metaphors not only appeared in poets, dramas, or any written works, but also took place in our conversations without discordance. In the research from Graesser, Long, and Mio (1989), they found that television program host used around one metaphor for every 25 words. This further convinced us that our conceptual system was fundamentally metaphorical (Lakoff & Johnson, 2003). With the surprise of the using frequency of metaphor, its comprehension way is in the spotlight too.

Terms Used in Metaphor Comprehension

Tenor and Vehicle

Syntax was the rule of sentence creation (Chomsky, 2002). We all knew that the simplest form of a meaningful sentence was composed of a subject, followed by a verb, so as the metaphor. In 1936, Richard proposed a series of terms for naming and differentiating the ingredients of a metaphor, like *tenor* and *vehicle*. The tenor referred to the subject wanted to ascribe, while the vehicle was the object, image, or idea used to attribute to the subject. Take the classical monologue, "All the world's a stage" from the work of Shakespeare, "As you like it", as an example. The "world" was the tenor of the metaphor, while "the stage", which was the vehicle, was used to compare with "the world". His tensive view, which stressed the comparison among the terms, further suggested how they functioned in the sentence and created other representation, symbolic meaning, and tension while reading. In fact, different theories or comprehension models would use different terms to re-name tenor and vehicle, but the syntax of the words in the sentence was the same. In this research, target was referred to tenor and vehicle remained the same.

Metaphor Comprehension Theories and Models

Conceptual Metaphor Theory

Conceptual metaphor theory also named as the contemporary theory which had played an important role in understanding the cognitive mapping in metaphor comprehension. In 1980, Lakoff and Johnson published *Metophors We Live by* and conceptualized the perception of metaphor. The *target domain* that they referred to was the tenor and *source domain* was the vehicle. In the influential and long-established metaphor, "Love is a journey", we could clearly see that the target domain was "love", and the source domain was "journey". According to the conceptual metaphor model, they held a belief that there was a general rule to govern our linguistic expression, as well as an underlying principle that could control our inference pattern of metaphor. That meant when we could always comprehend metaphor by tracing back the inference pattern from the conceptual domain to another domain. Technically, they said that it was a mnemonic, a tightly structured mapping for a set of ontological correspondence in which the shared characteristics by the target and source domain were constituted the bonding for comprehension. The key essence of comprehending conceptual metaphor was to use knowledge of dissimilar to understand the abstract concepts (Lakoff & Johnson, 2003). This conceptual mapping was an entailment process, a mental association between the corresponding descriptive or related meanings of the concepts (Gentner, 1983).

So, back to the example "Love is a journey", we mapped the ontology of travel onto the ontology of love which included the ideas of two lovers who were in a functional relationship and could achieve life goals together (Lakoff, 1993). The more characteristics which could match from the source to the target, the higher the confidence level to understand the behind meaning of the metaphor. Although this theory could not provide a sophisticated mapping procedure like the comparison, it was acknowledged on the thinking capacity of human and social information processing.

Comparison Model

The comprehension of metaphor, in cognitive aspect, has been studied for a long history. The earliest discussion of the relationship of metaphor to language and its role was begun with the belief from Aristotle, in which he (1926) thought that metaphor itself was an implicit comparison and should be understood based on the analogy principle, which was re-named, in the modern term, as *comparison theory* (as cited in Ortony, 1993). Later, it was modified by Max Black. Firstly, he (1993) claimed that it was not a matter that the semantic meaning of the metaphor sentence was illogical. For example, everyone knew that Romeo' eyes could not really lighten up (e.g., "The light that shines comes from thine eyes"), but people understood what Juliet tried to express was that her lover, Romeo was her life or the only one could make her happy. Black emphasized the overall comprehension of metaphor which was irrelevant to sentence structure but could only be achieved through imagination and comparison. Secondly, he suggested another two terms to describe the structure of comprehending metaphor, named *focus* and *frame*. Although the places in the sentence might be the same as the vehicle and the tenor respectively, what they represented was totally different. The focus would be the emphatic metaphorical utterance and the *frame* would be the remaining part of the sentence in which proposed no metaphorical meaning. Instead of naming the subject and object as the *tenor* and the *vehicle*, these became a conceptual view on differentiating the components of metaphor. However, there was no further demonstration on how people linked the two different concepts together and attained a new meaning for metaphor as he only stated that the commonplaces associated between the two concepts were picked as the outcome of metaphor interpretation (Ayoob, 2007).

After that, his followers, including Ortony, Bowdle, Gentner, and others, filled up the gap and used his idea to further develop the comparison model, while the terms *topic* and *vehicle* were replaced by *target* and *base* respectively. The salience imbalance mechanism by Ortony first came out and suggested four possible types of matching to account for the difference between literal and metaphoric comparison statement: (a) The shared properties were particularly salient for the target only (e.g., "Vanilla ice-cream is like salad dressing"); (b) for the base (e.g., "Some banners are like warts"); (c) they were low salient (e.g., "Bat is an airplane"); or (d) high salient for both target and base (e.g., "Banners are placards"). From the four types, only the imbalance of salience feature between the target and base was the constraint to judge how metaphorical the utterance was, in which the significant mutual characteristics of the base were used to project onto the target or vice versa. Hence, the statement of low salience or having too common properties of both target and base were seen as literal (Haught, 2013). Yet, the criterion could not specify point to the difference between literal and metaphoric comparison statement, as human created both according to the same criteria.

Later, Gentner (1983) put forward the feature-mapping model to compensate the limitation of the salience imbalance theory and expanded the idea of conceptual metaphor model. Two distinctive principles came to firstly check or examine the relation strength between objects, but not the attributes of the objects. Then, the relation mapping was determined by the high-order relation systematically. In this structure mapping engine,

Falkenhainer, Forbus, and Gentner (1989) believed that matching was the initial step to check whether the target and base had shared features. Then, people started to enrich the interpretation by mapping the base features to the target. Additionally, they drew a conclusion that metaphor was basically equal to implicit simile, under the assumption that the *literal* and the *figurative* meaning of metaphor could be expressed by simile (Fogelin, 1988). When people recognized they could no longer interpret the utterance by literal sense, they would search for a non-literal "true" alternative to explain to make sense (Fogelin, 1988; Bowdle & Gentner, 2005; Ortony, 1979; Searle, 1979). To demonstrate, the classical metaphor, "The job was a jail", was to be used. Literally, we understood that one's job could not be a jail, so we looked for another explanation, which was the figurative meaning, to make the statement sensible. According to the comparison model, we could convert the metaphor sentence into simile form, "the job was like a jail" during comprehension. Then, finding the salient properties between the target and base in daily context was the next step. Once, the shared characteristics like the lifestyle of "our job" and "jail" were identified, we could easily pick the most sensible subset of the characteristics (i.e., "poor and unpleasant life") to comprehend that metaphor (Gentner, Bowdle, Wolff, & Boronat, 2001). In short, this model advocated the metaphor comprehension was a projection process from the base to the target and viewed as a simile (Gentner, 1983; Gentner & Wolff, 1997; Miller, 1993). The metaphor described was under the feature-matching model and referred to the second type illuminated by the salience imbalance mechanism, meaning that high salience of the base was reflected (see Figure 1).



Figure 1. A structure-mapping engine of metaphor comprehension: The job was a jail.

Parallelism and Strength

On top of the feature mapping model and the imbalance theory, there was an important concept, parallelism, triggering psychological analogy between target and source, paving the way to meaningful construction. Three models were included: Structure-Mapping Engine (SME) (Gentner, 1983; Gentner et al., 2001), Analogical Constraint Mapping Engine (ACME) (Holyoak & Thagard, 1989), and Incremental Analogy Machine (IAM) (Keane & Brayshaw, 1988). These three models emphasized the strong strength of parallelism and applied in the comparison model. The SME portrayed the maximal structurally consistent match of target and base that could be observed one-to-one mapping with parallel connectivity (Forbus, Gentner, & Law, 1995). Formerly, the structure of the sentence was systematically aligned and then the common features of both target and base which could be inferred according to the relations and commonalities directionally or nondirectionally. The beginning stage usually was one-to-many mappings, not until the kernels appeared to reinforce one-to-one mapping and parallel connectivity helped to control the interpretations. Next, the predicate between the target and base was considered and applied if it could connect into the aligned structure and carried unique features to the target for

interpretation. Therefore, that the richness of interpretations came from adopting the mechanism of SME approach was confirmed.

The ACME focused on the structural, semantic, and pragmatic constraints between the analogs, which deposed into steps for reading, like retrieval or selection useful base analog, mapping, inferencing, or transferring and subsequent learning (Holyoak & Thagard, 1989). For example, "The job was a jail". The meaning of jail was its unpleasant condition and the exploitation of freedom. These two directions of interpretations needed to be context-specific instead of utilizing relevant base matching. When the aspects were present, the meaning drawn was more accurate by paralleling the job as an object to compare jail which was also as an object.

The IAM was a simpler model for analogizing than SME and ACME and suggested the heuristically working from the largest connected structure in the base domain, meaning that time course was one of the indicators different from the other models. The use of representation, match-reduction, and prioritization was singly lineated, so the process was swiftly and apt (Keane & Brayshaw, 1988; Keane, Legeway, & Duff, 1994).

Categorization Model

Another approach, categorization arose and used *topic* and *vehicle* to describe the components appeared in metaphor. Glucksberg and Keysar (1990) claimed that the interpretation of metaphor was different from simile and metaphor should be comprehended as a categorization assertion under the principle of *dual reference*, in which topic or vehicle could be polysemous (Glucksberg & Haught, 2006), meant that word was able to induce other representations. They pointed out that when the salient features of the vehicle did not associate with the topic literally, people came to grasp with metaphor by searching the prototypes or ad hoc categories of the vehicle and then attributing the properties to the topic (Glucksberg, 2008; Glucksberg & Haught, 2006; Glucksberg & Keysar, 1990; 1993; Glucksberg & McGlone, 1999; Glucksberg, McGlone, & Manfredi, 1997). The metaphor vehicle could be exhibited as a hierarchical organization, which meant that the attribution concept of metaphor could be expressed by a particular item from different abstraction levels (i.e., superordinate, basic, and subordinate level) until that level was able to symbolize something¹ (Glucksberg & Keysar, 1990). For the sake of providing a vivid picture on how the categorization model worked, the above example was used for demonstration again. The significant relevant features of "jail" included the unpleasant condition, feeling, of loss of freedom and being poor. People might also think of the furniture or the guards in the jail. The vehicle "jail" literally meant a building used to detain criminals, but it did not instantly apply to the topic "job". Those imaginative scenarios created acted as a metaphorical category of the vehicle concept and the topic later could be understood as a part of the category. Previously, Glucksberg and Keysar did not mention which kinds of categories generated should be chosen as the final decision, but they suggested that the most typical or the first popping up image of the vehicle categories would be chosen for interpretation. Hence, when people analyzed that metaphor, they would compare their jobs were poor rather than the furniture in the jail. This also matched with the idea of the salience imbalance theory, as well as reflecting the property attribution instructiveness between topic and vehicle.

Moreover, categorists suggested that metaphor was read as a paradigmatic class-inclusion statement (Glucksberg & Haught, 2006) because comparison theory could not explain the richness of interpretation in metaphors, but categorization theory could. Experiment on metaphor and simile interpretation reflected that

¹ In our perception, fruit was treated as the superordinate level, orange was at the basic level, and Sunkist would be the subordinate level. People could immediately understand that Sunkist was included in the categories of orange or fruit, to create references.

people tended to give true and reasonable properties of metaphor in comparison form. For instance, when using vehicle-*diamond* to describe the topic-*idea*, people ascribed the conventional characteristics of diamond like "valuable" and "rare" to the idea in simile structure, but they could give out more explanations like "insightful" and "creative" when understanding metaphor as a categorization assertion (Zharikov & Gentner, 2002).

Blending Theory

In terms of the notion and framework, the blending theory was highly akin to the conceptual metaphor theory. One of the distinctions of the blending theory was the different approach of treating metaphor, which was an indirect on-line processing (Fauconnier, 1994; 1997). As mentioned, contemporary theory suggested that elements or entities associated with the source domain from the long-term memory were used to depict the image, situation, or any expressions of the target domain, in which this idea emphasized that domain was the foundation of cognitive organization or mapping (Lakoff, 1993).

Blending theory viewed that *mental space* was a better way for the mapping approach, since the content in communication was always influenced by time and temporary circumstances. Mental space which was a partial, personal, and representational package tried to accentuate more of the scenario of the four spaces, comprising the two *inputs spaces* (the source and target), a *generic space* (conceptual structure shared by the two entities), and the *blend space* (combination and interaction of the two inputs) (Fauconnier, 1994, 1997; Turner, 1996a). Usually, it included the time, temporal, and counterfactual blend during comprehension, like retrieving experience for comprehension (Chilton, 2009). This approach was more comprehensive than the contemporary theory in the sense that it explained the hidden part between the two inputs. Besides, this blending theory was suitable in comprehending novel metaphors due to its additional blending concept. The basic three steps of blending were *composition*, *completion*, and *elaboration* (Fauconnier & Mark, 1998; Grady, Oakley, & Coulson, 1997; Turner & Fauconnier, 1995).

To show how the blending worked, "The surgeon was butcher" was used to demonstrate the three essential stages. To begin with, the content or knowledge of the surgeon and butcher popped up and two input spaces were created, plus crossing one another to induce a generic space which was the area to store the commonality of the two inputs. Hence, people would have the roles, identities, places, goals, and means of the surgeon and butcher in the two input spaces and the generic space would include the shared properties after fusion or selective projection.

Next, composition took place in which only the related elements of the two inputs were projected into the blended space where for completing the emergent structure, which yielded the new concept of "incompetence" of surgeon (Fauconnier & Turner, 2008). Then, elaboration allowed imagination, in which the principle of logic was the guidance for final interpretation. The operation on a surgery patient was possibly done by the doctor but his/her action of carving was as rude as the butcher who also used sharp object to cut meat, so we could at last understand how incompetence of his/her professional. The emergent structure was regarded as the core part of the whole blending process.

To sum up, this blending theory would be a possible method for humans to understand difficult metaphor. It was specifically advantageous for the type of metaphor that its topic or source could not give out any salient characteristics for attribution (see Figure 2).



Figure 2. Conceptual integration network: The surgeon was butcher. Reprinted from "Blending and Metaphor", in *Cognitive Science*, by J. E. Grady, T. Oakley, & S. Coulson, 1997, retrieved April 9, 2015, from http://cogweb.ucla.edu/CogSci/Grady_99.html/. Copyright 2001 by Francis F. Steen. Reprinted with permission.

Characteristics of Metaphors

The Career of Metaphor

Bowdle and Gentner (2005) in the discussion of career of metaphor tried to explain which types of metaphors suited to use which models or theories to comprehend. They had consolidated the important characteristics to determine the difficulties and time used when comprehending metaphor, which were *conventionality* and *aptness*.

Conventionality

Conventionality had two kinds of definitions. The first definition was the target-vehicle pairing familiarity, which was the extent of frequency of hearing that metaphor in daily life. The higher the conventionality of that metaphor, the more the times we heard of it. The second definition was the relationship between the metaphorical vehicle and its figurative sense (Gibbs, 1992; Lakoff & Johnson, 2003). This focused on how often people made use of the vehicle to hint another implicit meaning. In fact, the second definition was used to classify the two types of metaphors, which were *novel* and *conventional metaphor*. The main difference of them was rested on

the ontology of the vehicle, in which novel vehicle was restricted to domain-specific concept but conventional vehicle could be instantly pointed to metaphoric category due to its domain-general nature, allowing people a broader view to think about (Bowdle & Gentner, 2005). To illustrate, we could examine the vehicles, airplane, and journey from the metaphors "Bat is an airplane" and "Life is a journey", in which the first one was a novel metaphor and the second was a conventional metaphor (Jones & Estes, 2006). "Airplane" literally was referred to an aircraft driven by the thrust from a propeller but could not produce the metaphorical effect of travelling fast independently. For the vehicle "journey", it was not only referred to the road, but also to the growth of a person. This association between the literal sense and implicit figurative meaning was the main difference of the two types and explained the second definition of conventionality.

Aptness

Aptness referred to the extent which the figurative meaning of the vehicle could catch the property of the topic referred to. Similar to conventionality, it was discovered to be correlated with the comprehension time. High apt metaphor therefore was studied faster (Chiappe & Kennedy, 1999; Glucksberg & Haught, 2006; Glucksberg & McGlone, 1999; Jones & Estes, 2006). From the above examples used in demonstrating the conventionality, we would give a lower aptness rating for "Bat is an airplane" and a higher rating for "Life is a journey". The reason was that the shared characteristic between the target and vehicle was "to fly", but the characteristic of "airplane" like travelling fast might not suit in describing the "bat", so the rating was low. On the other hand, the property of "journey" like ups and downs matched to ascribe the happy or sad moment in the events, trips, or memories of "life", thus the rating was high.

Comparison Model vs. Categorization Model

Currently, much evidence (Glucksberg, 1993; 2008; Glucksberg & McGlone, 1999; Glucksberg et al., 1997) favored the model of categorization, while Bowdle and Gentner (2005), the advocators of comparison model, believed that conventionality² was decisive in determining the metaphor comprehension. It claimed that when metaphor used repeatedly and became conventional, there was a possibility of direct shift from comparison to categorization in comprehending conventional metaphor, but comparison form remained favorable to understand novel metaphor. Yet, categorization theorists suggested the indicator to determine the metaphor processing was aptness (Glucksberg & Haught, 2006; Jones & Estes, 2006). The reason was that conventionality referred to the vehicle only and omitted the attributed and related properties in both topic and vehicle (Chiappe & Kennedy, 1999; Chiappe, Kennedy, & Smykowski, 2003; Glucksberg & Keysar, 1990; Glucksberg & McGlone, 1999; Glucksberg et al., 1997).

Controversy Between Conventionality and Aptness

Experiment done by Jones and Estes (2006) showed that in novel and conventional metaphors, the higher the aptness, the faster the speed of comprehension, while conventionality showed no mediation between the vehicle and the prediction in comparison form or categorization in conventional metaphor. Also, they criticized that most of the materials used in the experiment done before including the career of metaphor had not yet been controlled by conventionality and aptness. That meant the concepts of conventionality and aptness, as well as the types of metaphors (i.e., novel and conventional metaphors) were mixed in the stimulus without separating them

² Conventionality in Bowdle's and Gentner's (2005) research referred to the association of the vehicle and its meaning underneath.

independently (i.e., absence of counterbalance). Yet, Thibodeau and Durgin (2011) pointed out that Jones and Estes manipulated too much on these two variables, in which they created some conventional metaphors that the vehicles were absent of shared characteristics with the topic, like "A fisherman is a spider". It was not difficult to infer that the fish net used by the fisherman shared some characteristics with the spider web produced by a spider, but the topic and vehicle here were not the fish net and spider web. To conclude, it seemed that conventionality and aptness were related or even there was a particular part which was overlapped, while it required further investigation. Logically, people would not make non-sensible metaphor while expressing themselves indirectly. From this point of view, too much manipulation was inappropriate. Black (1962; 1993) also mentioned that there might be some interaction effect from the topic to the vehicle to create metaphor.

Nominal Metaphor vs. Predicative Metaphor

Metaphor comprehension had a long history of the study with nominal metaphor (e.g., "Love is a journey", "A fisherman is a spider", "Bat is an airplane", and "The job was a jail"), while it had fewer research talked about the predicative one. In truth, studies from the above models focused on nominal metaphor only. One of the huge differences between nominal and predicative metaphor was rested on the sentence structure which generated different metaphorical ways of expression.

First and the foremost, the composition of nominal metaphor used the verb "be" to link with the target and vehicle; the sentence would be like "The girl was a rose" (i.e., X is Y). Predicative metaphor, on the other hand, diversified the "verb" vocabularies to constitute a metaphor (Glucksberg, 2001). "The car flew" [i.e., X + Verb (usually was used to describe Y)] was the example of predicative one.

The next discrepancy was about the identity or the thing that was being processed. In nominal metaphor, object was portrayed figuratively to put down its prominent properties on the target, but predicative metaphor made use of "verb" to illustrate characteristics of states, events, or actions metaphorically, so as to ascribe those personalities on the target (Utsumi & Sakamoto, 2011).

Lastly, due to the given of the characteristic by the vehicle, the mapping structure was changed. In nominal metaphor, people searched for the related properties in both target and vehicle. Then, they attributed the shared characteristic from the vehicle to the target. However, in predicative metaphor, since the characteristic had been given, people did not need to find the shared features from both target and vehicle but tried to think about in what the target was showed out the characteristic provided. Thus, the mapping procedure was totally changed, even though we could still say the characteristic of the vehicle was attributed to the target.

Comprehension of Predicative Metaphors

Glucksberg (2001; 2003) from the categorization approach suggested that predicative metaphor comprehension was through a direct creation of categories from the verb. The higher the abstraction level of the verb, the greater the metaphorical meanings triggered out (Torreano, Cacciari, & Glucksberg, 2005). The abstraction level mostly contained the time, speed, space, and spatial concepts. It could be also related to politics, religions, artificial intelligence, culture, and life experience. All these allowed feature mapping, categorization, or blending to happen or even a mixed approach when facing the predicative metaphors, which were no longer a "A is B" form.

Utsumi and Sakamoto (2011) alleged that the comprehension of predicative metaphor was by an indirect or two-stage thinking process, in which the correspondence of the vehicle was mediated by an immediate entity before a conclusion drawn. In this model, there were two possibilities to considerate which things or objects were the Mediators: (a) abstract conditions or actions caused by or related to the verb; and (b) objects or entities induced by verb's argument instantiation (see Figure 3).



Figure 3. Two possibilities of an intermediate entity: The rumor flew in the office (2011). *Note.* From "Indirect Categorization as a Process of Predicative Metaphor Comprehension" by A. Utsumi and M. Sakamoto, 2011, *Metaphor and Symbol, 26*(4), p. 303.

Given an example of "Technology goes moldy", according to the Rule (a), people might pop up the category of virus, food, or any other pleasance as the vehicle 'goes moldy" usually referred to unwanted condition by human; from the Rule (b), it would be an agent that being infected, like something that could be eaten or overdue. This comprehension process was still a categorization, but it was noticeable that the next step might require blending to generate the interpretation. The generic space between "technology" and "goes moldy" was "the time". People at last emphasized the "moldy" characteristic on the "technology".

Overview of Present Research

Tremendous past studies focused on nominal metaphors, but there were few researches trying to uncover the ways of the predicative metaphor comprehension, except the two-way processing categorization model. However, it was still incomprehensive to explain when people chose to use Mediator (a) or Mediator (b) to comprehend predicative metaphor. The result from Utsumi and Sakamoto (2011) also revealed that predicative metaphor had no relationship with conventionality and aptness. This seemed to tell that the current classifications of predicative metaphors by conventionality and aptness might not be enough or suitable to differentiate the characteristics of predicative metaphors, so that it induced the limitations to tell the criteria of selecting the Mediator (a) or Mediator (b). To improve the current explanations of predicative metaphor comprehension, this research suggested another combination to classify predicative metaphors. They were *aptness* and *typicality of the source*.

The concept of aptness was the same, while the conventionality³ was eliminated since it was too difficult to find out predicative metaphors which were heard often in Chinese culture. Aptness would be an appropriate indicator as people would know that if they understood the meaning of predicative metaphor though they might seldom hear it.

For the typicality of the source, it was an idea borrowed from the *typicality effect* used in psychology, stating that people were able to make quick category judgment by thinking the salient or common category member (R. J. Sternberg & K. Sternberg, 2012). If people were asked to think of "a flying entity", even though there were many living things that were able to fly, they would pop up the image of "a bird" rather than "a bee" immediately

³ In this research, conventionality was referred to the familiarity of the target-vehicle pairing.

under circumstance that there wwa absence of other hints. The reason was that "a bird" in our memory was more typical for the category of "a flying entity". This "source" inducing way or called "source comprehension" further explained why the Mediator (b) took place in the indirect categorization model.

Yet, the typicality of the source was not referred to salient characteristic representing "an entity". It was the strength or the association between the vehicle and the source. To illustrate this concept more clearly, taking an example of "a machine", people might think of the "operation style of a machine", while it was difficult to imagine that it was "broken" until someone mentioned about it. If people were asked to rate the typicality level of "a machine" was "broken", it was expected to be low. If we referred to the example of "a bird" and "to fly", the rating was high. The reason was that the typical attribution of "a bird" was the action of "fly", while "a machine" was referred to its "special function", but not its "situation". This process of comprehension was highly related to the parallelism and strength, suggesting a heuristic of thinking of a source entity for comprehending different level of metaphors. The more typical the metaphor was, the swifter the people thought of the source entity and generating possible and sensible explanations.

Our research consisted of two experiments. Experiment 1 was the rating tests of Chinese predicative metaphors, which aimed to classify the metaphors into groups according to aptness and typicality. Experiment 2 was the practical memory and comprehension tests, in which aptness and typicality were the independent variables. The priming effect, which was another independent variable, was assisted to show out the typicality. For the dependent variables, they were the recalling numbers of the predicative metaphors, the average corrected reaction time of each metaphor, and the numbers of accuracy in comprehension test. After all, three hypotheses are generated to address the research questions:

H1: High typicality predicative metaphors predict better recalling, faster comprehension speed, and higher accuracy of correct answers and vice versa;

H2: High-apt predicative metaphors predict better recalling, faster comprehension speed, and higher accuracy of correct answers and vice versa;

H3a: Priming on high typicality predicative metaphors will have better recalling, faster comprehension speed, and higher accuracy of correct answers than no priming;

H3b: Priming on low typicality predicative metaphors will have lower recalling, comprehension speed, and numbers of accuracy than no priming.

Experiment 1

For creating a new set of Chinese predicative metaphors, online-rating tests were done to find suitable metaphors for this study. The rating tests were divided into two parts. The first part was to find proper vehicles (i.e., verbs) with the typical characteristics of the source. The second part was to examine the aptness degree of the new predicative metaphors.

Method

Participants. There were 11 and 52 native Chinese speakers aged from 18 to 23 helping to rate in the first rating test and second rating tests respectively.

Materials. The Chinese predicative metaphors in this study were modified and innovated according to Chinese proverbs, lyrics, and poems or adapted from past literature⁴. There were several steps before creating the

⁴ Some of the examples were adopted from the literature of Utsumi and Sakamoto (2011).

predicative metaphors. Firstly, the vehicles (i.e., verbs) were inspired by the Chinese proverbs and dictionary and would be rated in the first rating test to see if they were the typical characteristics of corresponding sources. Secondly, the appropriate vehicles after rating were matched with different targets. The minimum requirement was that the combinations should be able to induce meanings that were understandable (see Appendix C). For example, the verb "fly" would apply to the targets "my heart", "technology", "economic", and others. Thus, several predicative metaphors like "my heart flies", "technology flies", and "economic flies" were invented. Next, the predicative metaphors were scored in the second rating test which rated for aptness, so that we could classify them into high and low apt groups, as well as picking the distinctive scoring metaphors for our study. Also, there were four interpretations provided for the participants to choose the best for the predicative metaphors. For example, the metaphor of "dream flies" would be understood as "dream can be achieved", "dream flies highly", "dream flies away" (see Figure 4).

Verbs: 飛翔,沸騰,發霉,短路,下沉,爆炸... Targets:科技,事業,經濟,人生,青春,血脈... Example: 科技飛翔,事業發霉... Figure 4. The process of creating predicative metaphors.

At last, 40 predicative metaphors were selected and were divided into four groups: high typicality/high-apt, high typicality/low-apt, low typicality/high-apt, and low typicality/low-apt metaphors.

Procedure. In the first rating test, it was for finding the suitable vehicle which was the most typical characteristic of its corresponding source. For instance, the vehicle "fly" was the most typical character of the source "bird" and "bird" was the most typical example of the characteristic of "fly". We call this element *typicality*. Participants were required to rate two types of questions to find out the vehicles with high typicality: (a) if the characteristic of a particular verb is the most typical example to represent the characteristic of a particular verb. The rating scale was from one to seven ("Very disagree" to "Very agree"). About the second rating tests, each participant was given three to four sets of predicative metaphors, the compositions of different targets and vehicles to rate from one to seven ("Not at all apt" to "Extremely apt") how apt the predicative metaphors are. The second rating tests were done repeatedly until there were adequate numbers of predictive metaphors for the Experiment 2.

Ethical issue. Before the beginning of the rating test, participants would need to agree an informed consent though the Internet. They would be told that the data collected were for research purpose only and any information related to personal identity was confidential.

Results

First rating test. Eleven participants voluntarily participated in test and gave scores for two types of questions in the first rating test: (a) if the characteristic of a particular verb was the most typical characteristic of a corresponding source; and (b) if the corresponding source suggested was the most typical example to represent the characteristic of a particular verb. The purpose of Question (a) was to examine the strength between a particular verb and its corresponding source and Question (b) was checked if the corresponding source suggested was the most typical characteristic that

was representing "an entity", Question (a) was the critical requirement to determine whether the vehicles (i.e., verbs) had greater strengths with the source, as well as defining the conditions: high typicality (M = 4.45, SD =0.68) and low typicality (M = 3.23, SD = 0.49). It was also statistically significant regarding with the factor of typicality by running the Independent Samples T-test for the chosen metaphors, F(1, 18) = 2.07, p < 0.001. For the Question (b), the corresponding examples suggested were slightly significant, F(1, 18) = 4.12, p = 0.063. That meant that the participants thought that there would be better alternative sources for the characteristics of the particular verbs.

Second rating tests. Fifty-two participants had joint to give the aptness rating and choose the best interpretations (would be mentioned in the Experiment 2) for the predicative metaphors created. Independent Samples T-test analysis was done for the chosen metaphors, in which high-apt (Mean = 4.88, SD = 1.27) and low-apt (Mean = 3.44, SD = 1.42) predicative metaphors (examples can be referred to Table 1) were statistically significant, F(1, 444) = 127.35, p < 0.001, while typicality had no significant difference. These results helped to predict that aptness might be an important indicator for metaphor comprehension.

Table 1

| Example | of Materials | and Mean | of Aptness | Rating |
|----------|-----------------------|----------|------------------------------|--------|
| Britting | <i>oj 112000 1000</i> | | <i>cj</i> 1 <i>p m c s s</i> | |

| Types of predicative metaphor | Example | Aptness rating | Corresponding source |
|-------------------------------|----------------------------------|----------------|----------------------|
| High typicality/high-apt | 愛情盛開 (Love is blossoming) | 5.60 (0.97) | Flower |
| High typicality/low-apt | 資源飛舞 (Resource flies and dances) | 1.91 (1.04) | Butterfly |
| Low typicality/high-apt | 家庭瓦解 (Family is crumbled) | 5.78 (0.44) | Land |
| Low typicality/low-apt | 心聲沸騰 (The inner sound boils) | 2.85 (0.99) | Water |

Note. Aptness scale = 1 (Not at all apt) to 7 (Highly apt) (*SD*).

Experiment 2

In the Experiment 1, we had already selected 40 suitable predicative metaphors for the Experiment 2, in which the purpose of it was to examine the memory of predicative metaphors after classification (refer to *Materials*) and comprehension process if people understood predicative metaphors by chasing the sources of the vehicles.

Method

Participants. There were 60 participants taking part in the experiment. All of them were Hong Kong Shue Yan University undergraduates and native Chinese speakers. Before analysis, a total of four participants were eliminated based on the definition of extreme values, in which their response times in comprehension test were three standard deviations above the total participant's mean. The four outliers were equally distributed in each condition, so we had finally counted 56 participants in the data analysis. The experiment was conducted in the cognitive psychology laboratory. Students who had used the psychology participation pool system to enroll this experiment would attain two marks for their psychology course requirements.

Materials. Forty Chinese predicative metaphors selected in the Experiment 1 were equally distributed into four groups: high typicality/high-apt/priming, high typicality/low-apt/priming, low typicality/high-apt/no priming, and low typicality/low-apt/no priming. Hence, each participant would see 20 predicative metaphors in each group.

Priming materials. Twenty pictures related to the corresponding sources suggested had been drawn by the experimenters. These were used in the priming paradigm (see Appendix C).

Design and procedure. The experimental design was a mixed factorial design, in which typicality (high and low) and priming (priming and no priming) were between-subject design, and aptness (high and low) was within-subject design. The experiment was conducted with the support of an e-prime 2.0 program, which was for creating the priming condition, counting the reaction time and accuracy numbers of corrected answers. In this experiment, participants would go through three processes: a memory test, distraction task, and comprehension test respectively.

In the memory test, participants would first read the instructions for knowing how to react with the e-prime 2.0 system. A fixation mark (+) was presented at the center of the PC screen to inform the participants that a metaphor was presented at the same location. In general, the participants who took place in the priming condition had 2,000 ms to see a picture related to the corresponding source, followed by 5,000 ms to read and memorize a metaphor, which was presented one by one at the center of the PC screen. For the no priming condition, they had 7,000 ms to read the metaphors. The time of priming was tested and measured to be adequate for general comprehension process.

Afterwards, they would do a two-minute distraction task, a mathematic test (see the Appendix D) before recalling 20 predicative metaphors on a piece of white paper. Complete sentences were counted as "successfully retrieved the metaphors". Poor handwriting or forgotten how to write the words of the predicative metaphors was also counted. However, the mismatch of the targets and the sources or using similar wordings of the targets or sources was not counted even though the meanings of the metaphors were not distracted. The test was stopped after three minutes. They would move onto the comprehension test.

In the comprehension test, participants had 2,000 ms to read each metaphor, followed by a screen with three options of the answers for them to choose. The right-hand side number keyboards "1", "2", and "3" were the response keys of the option "A", "B", and "C". These processes were repeated until they had answered all 20 predicative metaphors. There were no time limits in this test. Besides, the interpretations of the correct answers were based on the highest choosing numbers in the second rating tests, in which there were four interpretations for the participants to choose, while similar and opposite answers of those correct answers were made to be the other alternatives of the three options.

Ethical issue. The experiment had been passed to the Human Research Ethics Committee. Consent form would be given to the participants before they conducted the experiments. They would be told that the data were for research purpose only and any information related to personal identity was confidential. Finally, they would receive a debriefing form when they completed the experiment.

Results

Memorizing predicative metaphors. In this study, the maximum number of whole recalling was 12 and the minimum was one for each participant. By running the Three-Way ANOVA analysis, aptness had a main effect, F(1, 104) = 6.20, p < 0.05. High-apt metaphors (M = 3.00, SD = 1.32) were remembered statistically more than low-apt metaphors (M = 2.36, SD = 1.43) (refer to Table 2). Typicality and priming did not have main effect results, but they contained the interaction effect, F(1, 104) = 5.53, p < 0.05 (refer to Figure 5). Comparing between the conditions of priming and no priming, high-apt metaphors with high typicality (M = 3.36, SD = 1.45) in priming condition had significant increase of the number of whole recalling than no priming condition (M = 2.64, SD = 1.34) (refer to Table 3). Low-apt metaphors with high typicality (M = 2.57, SD = 1.65) and priming effect also had a higher number of whole recalling than in no priming condition (M = 1.79,

SD = 1.37) (refer to Table 3). This suggested that priming had a significant positive effect on recalling metaphors with high typicality. However, the priming effect revealed a contrasting effect in metaphors with low typicality condition which had a lower number of whole recalling than priming condition.

Table 2

Mean of Whole Recalling Number in Typicality, Aptness and Priming of Predicative Metaphors in Experiment 2

| Variable | Typicality | Aptness | Priming |
|----------------|-------------|-------------|-------------|
| High/priming | 2.59 (1.52) | 3.00 (1.32) | 2.75 (1.38) |
| Low/no priming | 2.77 (1.29) | 2.36 (1.43) | 2.61 (1.45) |

Note. Whole recalling number (SD).

Table 3

Mean of Whole Recalling Number in Memory of Predicative Metaphors in Experiment 2

| Variable | High ty | High typicality | | ypicality |
|------------|-------------|-----------------|-------------|-------------|
| variable | High-apt | Low-apt | High-apt | Low-apt |
| Priming | 3.36 (1.45) | 2.57 (1.65) | 2.57 (1.09) | 2.50 (1.23) |
| No priming | 2.64 (1.34) | 1.79 (1.37) | 3.43 (1.29) | 2.57 (1.45) |

Note. Whole recalling number (SD).



Figure 5. Whole recalling numbers: Typicality and aptness in priming condition.

Average correct reaction time. The meaning of correct reaction time referred to the time that participants were able to give a correct answer in the comprehension test. The total mean of the average correct reaction time was 4,281 ms. From the Three-Way ANOVA test, aptness remained statistically significant level, F(1, 104) = 3.90, p < 0.05, but typicality was closed to the 0.05 significant, F(1, 104) = 5.78, p = 0.51. The results reflected that high-apt metaphors (M = 3,949 ms, SD = 1,395 ms) were always faster in comprehension speed no matter priming effect was involved or not than the low-apt metaphors (M = 4,613 ms, SD = 1,542 ms) (refer to Table 4).

However, under the priming condition, the low-apt metaphors with high typicality (M = 3,817 ms, SD = 1,059 ms) needed fewer time to be comprehended than in no-priming condition (M = 4,630 ms, SD = 1,684 ms) (refer to Table 5). In this sense, the low-apt metaphors were even understood a little faster than high-apt metaphors, while there was no an interaction effect reported (refer to Figure 6).

Table 4

Mean of Average Correct Reaction Time in Typicality, Aptness and Priming of Predicative Metaphors in Experiment 2

| Variable | Typicality | Aptness | Priming | |
|----------------|---------------|---------------|---------------|--|
| High/priming | 4,008 (1,285) | 3,949 (1,395) | 4,256 (1,283) | |
| Low/no priming | 4,553 (1,657) | 4,613 (1,542) | 4,305 (1,703) | |

Note. ms (SD).

Table 5

Mean of Average Correct Reaction Time in Comprehension of Predicative Metaphors in Experiment 2

| Variable | High ty | igh typicality Low typicality | | ypicality |
|------------|---------------|-------------------------------|---------------|---------------|
| v allable | High-apt | Low-apt | High-apt | Low-apt |
| Priming | 3,950 (847) | 3,817 (1,059) | 4,213 (1,253) | 5,043 (1,606) |
| No priming | 3,634 (1,303) | 4,630 (1,684) | 3,998 (2,016) | 4,960 (1,584) |

Note. ms (SD).



Figure 6. Average correct reaction time: Typicality and aptness in priming condition.

Comprehending predicative metaphors. The accuracy was the number of correct answers that the participants had got in the comprehension test. The maximum number of the accuracy was 17 and the minimum number was 10. No one could get the full marks of the test, while the average numbers of the accuracy was 13.64. Under the Three-Way ANOVA test, only aptness and typicality were statistically significant, F(1, 104) = 59.68, p < 0.001 and F(1, 104) = 4.33, p < 0.05, respectively. Irrelevant to typicality and priming factors,

high-apt metaphors (M = 7.75, SD = 1.38) still had higher accuracy numbers than low-apt metaphors (M = 5.89, SD = 1.27) (refer to Table 6). That meant that participants were more capable in understanding high-apt metaphors, which were more rational and made sense. Interestingly, an interaction effect among typicality, aptness, and priming took place, F(1, 104) = 5.65, p = 0.019 (refer to Figure 7). In the high typicality and priming condition, it was found that the accuracy of high-apt metaphors dropped (M = 6.64, SD = 1.15) than in the no-priming condition (M = 8.29, SD = 1.07) (refer to Table 7). This suggested that participants' understandings towards the high-apt metaphors with high typicality were changed under the priming condition. It also hinted that the pictures shown in priming condition suggested other possible ways to understand that type of metaphor.

Table 6

Mean of Numbers of Accuracy in Typicality, Aptness and Priming of Predicative Metaphors in Experiment 2

| Variable | Typicality | Aptness | Priming |
|----------------|-------------|-------------|-------------|
| High/priming | 6.64 (1.54) | 7.75 (1.38) | 6.57 (1.59) |
| Low/no priming | 7.00 (1.68) | 5.89 (1.27) | 7.07 (1.62) |

Note. Number of correct answers (SD).

Table 7

Mean of Numbers of Accuracy in Comprehension of Predicative Metaphors in Experiment 2

| Variable | High ty | High typicality | | ypicality |
|------------|-------------|-----------------|-------------|-------------|
| variable | High-apt | Low-apt | High-apt | Low-apt |
| Priming | 6.64 (1.15) | 5.86 (1.17) | 8.07 (1.21) | 5.71 (1.68) |
| No priming | 8.29 (1.07) | 5.79 (1.37) | 8.00 (1.04) | 6.21 (1.37) |

Note. Number of correct answers (SD).



Figure 7. Numbers of accuracy: Priming and typicality in high-apt condition.

General Discussion

There are three main hypotheses in this study: The first hypothesis is that predicative metaphor with high typicality predicts better recalling number, faster comprehension speed, and higher numbers of accuracy in comprehension test. The second hypothesis is that high-apt predicative metaphor predicts better recalling number, faster comprehension time, and higher accuracy. For the third hypotheses, priming effect will have better recalling, faster comprehension speed, and higher accuracy when the predicative metaphor is high in typicality. For metaphor with low typicality, priming effect will decrease the recalling numbers, increase comprehension time, and lower the accuracy. All these hypotheses try to suggest when people choose to use Mediator (a) (i.e., categorization) or Mediator (b) (i.e., source inducing) to process predicative metaphors (Glucksberg, 2003; Glucksberg & Haught, 2006; Utsumi & Sakamoto, 2011). After the experiments, the second hypothesis related to the factor of aptness is generally correct, but the first and third hypotheses are correct in specific conditions only.

The results can be explained by the meaning activation and suppression during the memorizing part and metaphor comprehension. Categorization processing suggests that metaphor's vehicle activates metaphor-relevant meaning but suppresses metaphor-irrelevant meaning between the target and vehicle (Tomohiro & Takashi, 2012). That means we will not comprehend the metaphor of "The defense lawyer is a shark"⁵ to "The sharks are good swimmers" (metaphor-irrelevant meaning), but to comprehend "The sharks are tenacious" (metaphor-relevant meaning). However, the characteristics of the predicative metaphors are different from nominal metaphors, which the vehicle, the verb has already attributed the salient feature to the target (Glucksberg & Keysar, 1990; Utsumi & Sakamoto, 2007, 2011). People no longer need to think of the metaphor-relevant meaning between target and vehicle to process the metaphors. High-apt metaphors which can be quickly made sense in our brains are easier to memorize and comprehend than the low-apt metaphors in this study or previous studies (Lai, Curran, & Menn, 2009).

Memorizing Predicative Metaphor

The pictures shown in priming condition have strong association with the sources in metaphors with high typicality. This induces the metaphor-relevant meaning to enhance the memory. On the other hand, pictures which have lower association with the sources in the low typicality metaphors trigger off the metaphor-irrelevant meaning and increase the burden in memorizing. Thus, contrast to the positive relationship between high typicality and priming effect in recalling, the priming effect had a negative relationship with low typicality condition.

Predicative Metaphor Comprehension, Reaction Time, and Accuracy

This research finds that low-apt metaphors with high typicality have a faster comprehension speed after priming. It suggests that there is a chance for people to think of metaphor-irrelevant meaning to link with the target and vehicle to understand the metaphors. In fact, there are two reasons to support this suggestion: First, high typicality means that vehicle of the metaphor is the most typical characteristic of a particular representative source. Participants are easier to chase back to the source under the condition that the source in high typicality metaphor has less characteristics to induce. Second, since people have fewer concepts about the low-apt metaphors, in no doubt that, they are quicker to search for the origins when they comprehend the metaphors in

⁵ Adapted from Tomohiro and Takashi (2012).

high typicality. However, for other conditions, including high-apt metaphors with high and low typicality and low-apt metaphors with low typicality, the priming effect increases the comprehension time. The priming effect induces the metaphor-irrelevant meaning when participants comprehend the metaphors. It is found that high typicality and high apt group under priming condition are less accurate, suggesting that the priming of the source can induce more meanings for comprehension, though it is not necessary for those conditions to comprehend the metaphors through the source. For instance, high-apt metaphors have already limited the meaning of the metaphors and participants can acknowledge the meaning of the metaphors in a reasonable way without relating other categories to understand it. Thus, the comprehension time is the fastest in no-priming condition. Yet, there is no evidence to show that participants will not comprehend the high-apt metaphors with high typicality through the source because the lower accuracy rate between the priming and no-priming condition suggests that participants may think of the source, which induces more possibilities of comprehension, and the demonstration of longer comprehension time suggests the possibility. The occurrence of metaphor-irrelevant meaning under priming condition distracts the participants to understand the metaphors, while the answers provided are limited in expression. Participants may find difficulty to pick the correct answers.

For low-apt metaphors in low typicality, the priming condition does increase the comprehension time. This type of metaphors takes the longest time to understand in no-priming condition as low-apt metaphors are unreasonable in the participants' eyes and low-typicality means that the vehicle of the metaphor is not the main characteristic of the source. In this circumstance, we conclude that participants may not comprehend that metaphor through the source or they need longer time to reach the source.

Limitations

At last, the research has some limitations on the material part which may affect the results. Firstly, the numbers of participants in the Experiment 1 are limited, in which around 10 participants help in each rating tests. If the number of participants is higher, the classification of metaphors will be more convincing. Furthermore, due to the inadequate numbers of predicative metaphors, the vocabularies of the vehicles and targets in the metaphors are repeatedly used (refer to Appendixes A and B). This creates the difficulties in memorizing. In most of the time, participants mix up the correct source with the wrong target or vice versa. Thus, it lowers the numbers of recalling. Moreover, the priming pictures of "rusted iron" and "crumble land" are not able to represent the real objects; these may affect the interpretations during the comprehension test as the participants may not be able to recognize the pictures shown at the first time. All in all, the materials in this research can be improved.

Implications

Predicative metaphor is complicated in comprehension. Typicality, as the new concept in all metaphor studies suggests the strength between the vehicle and the source, helps in predicative metaphor comprehension. At the same time, it also proposes that people may comprehend predicative metaphors through the source and get to the direct categorization to understand it. Direct categorization refers to *particular* characteristic induced from the combination of the vehicle and source. For example, when people think of "a flying bird", they will quickly attribute a relevant situation of "flying highly" on that bird, but not to make an irrelevant attribution like "flying slowly". This calls as the direct categorization (refer to Figure 8).

To comprehend "dream flies", people will directly conceptualize the situation, which the dream flies highly when they can link the vehicle to the source. For another processing way, which is the categorization, people will

search from the hierarchical categories of fly like "fly highly", "fly away", "fly slowing", or etc., to match with the most possible situation to "dream flies". However, there are always many irrelevant meanings induced from this processing. High-apt metaphors, which are more reasonable, will help to limit the numbers of irrelevant meanings induced, while low-apt metaphors are depended on the participants' knowledge or experience. The result from this research suggests that the processing time of high-apt metaphors with high typicality is a little shorter (i.e., around 300 ms shorter, refer to Table 5) in no prime condition. Yet, the smaller standard deviation (i.e., the difference was around 500 ms, refer to Table 5) in priming condition tells that direct categorization gives stable comprehension speed.

For low-apt metaphors with high typicality, the result shows that it needs longer time to understand in no prime condition. This means unlike high-apt metaphors, more irrelevant meanings take place. For instance, to understand the predicative metaphor of "knowledge flies", people may take time to search for possible relevant meanings in categorization means like "fly highly", "fly away", and "fly quickly". At the end, they will match the stage that a "bird is flying away" with the situation of "knowledge is reducing" through blending, so as to comprehend that "knowledge disappearing from the brain" (refer to Figure 8).

For source comprehension, the particular characteristic like "flying high" may attribute directly into the target "knowledge". Yet, people have difficulty to comprehend the "knowledge flies highly", so they try to substitute "knowledge" into "bird" to conceptualize the situation again. Thus, they imagine a scene of the "knowledge flying highly and far away" from them and blend the situation to "knowledge disappearing in their mind" (refer to Figure 8). With the help of direct categorization and substitution, source comprehension needs less time (i.e., around 800 ms less) to comprehend the predicative metaphors (refer to Table 5).



Figure 8. Model of predicative metaphor: High typicality.

In fact, the low typicality situation is the same as the high typicality situation. The main difference is the longer time that people need to chase back to the source as the strength between the vehicle and source is low (refer to Figure 9). Another significant different in this model is the need of blending in low-apt metaphors, in which the target and vehicle are not as logical as high-apt metaphors, which are easy to understand, and people do not need to search for the possible situations from the target to match with the stage of the vehicle (i.e., blending). When people comprehend the metaphors through categorization means, they will activate more irrelevant meanings in low-apt metaphors than high-apt metaphors, so the model reflects that the categorization and matching part are larger (refer to Figure 8) (Tomohiro & Takashi, 2012).

All in all, this research tries to propose a new way to understand the comprehension of predicative metaphors and a new classification to differentiate the characteristics of it. It will be a step forward to understand how we conceptualize and relate different categories during metaphor processing.



Figure 9. Model of predicative metaphor: Low typicality.

References

Aristotle. (1926). The art of rhetoric. New York, NY: Putnam's.

Ayoob, E. (2007). Black & Davidson on metaphor. Macalester Journal of Philosophy, 16(1), 56-64.

Black, M. (1962). Metaphor. In M. Black (Ed.), Models and metaphors (pp. 25-47). Ithaca, NY: Cornell University Press.

Black, B. (1993). More about metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 19-41). New York, NY: Cambridge University Press.

Bowdle, B. F., & Gentner, D. (2005). The career of metaphor. Psychological Review, 112(1), 193-216.

Chiappe, D. L., & Kennedy, J. M. (1999). Aptness predicts preference for metaphors or similes, as well as recall bias. *Psychonomic Bulletin & Review*, 6, 668-676.

Chiappe, D., Kennedy, J. M., & Smykowski, T. (2003). Reversibility, aptness, and the conventionality of metaphors and similes. *Metaphor and Symbol*, 18(2), 85-105.

Chilton, P. (2009). Reading Sonnet 30: Discourse, metaphor and blending. In A. Musolff and J. Zinken (Eds.), *Metaphor and discourse* (pp. 40-58). London: Palgrave Macmillan. Retrieved from https://doi.org/10.1057/9780230594647_4

Chomsky, N. (2002). Syntactic structures. Berlin: Mouton de Gruyter.

- Falkenhainer, B., Forbus, K. D., & Gentner, D. (1989). The structure-mapping engine: Algorithm and examples. Artificial Intelligence, 41, 1-63.
- Fauconnier, G. (1994). Mental spaces. New York, NY: Cambridge University Press.
- Fauconnier, G. (1997). Mappings in thought and language. Cambridge, UK: Cambridge University Press.
- Fauconnier, G., & Turner, M. (1998). Conceptual integration networks. Cognitive Science, 22(2), 133-187.
- Fauconnier, G., & Turner, M. (2008). Rethinking metaphor. In R. W. Gibbs, Jr. (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 53-64). New York, NY: Cambridge University Press.
- Fogelin, R. J. (1988). Figuratively speaking. New Haven, CT: Yale University Press.
- Forbus, K. D., Gentner, D., & Law, K. (1995). MAC/FAC: A model of similarity-based retrieval. *Cognitive Science*, 19(2), 141-205.
- Gentner, D. (1983). Structure-mapping: A theoretical framework for analogy. Cognitive Science, 7(2), 155-170.
- Gentner, D., & Wolff, P. (1997). Alignment in the processing of metaphor. Journal of Memory and Language, 37, 331-355.
- Gentner, D., Bowdle, B., Wolff, P., & Boronat, C. (2001). Metaphor is like analogy. In D. Centner, K. J. Holyoak, and B. N. Kokinov (Eds.), *The analogical mind: Perspectives fromcognitive science* (pp. 199-253). Cambridge, MA: MIT Press.
- Gibbs, R. W. (1992). Categorization and metaphor understanding. Psychological Review, 99, 572-577.
- Glucksberg, S. (2001). Beyond comparison: Property attribution. In *Understanding figurative language: From metaphors to idioms* (pp. 52-67). Oxford, UK: Oxford University Press.
- Glucksberg, S. (2003). The psycholinguistics of metaphor. Trends in Cognitive Science, 7(2), 92-96.
- Glucksberg, S. (2008). How metaphors create categories-quickly. In R. W. Gibbs, Jr. (Ed.), *The Cambridge handbook of metaphor and thought* (pp. 67-83). New York, NY: Cambridge University Press.
- Glucksberg, S., & Haught, C. (2006). On the relation between metaphor and simile: When comparison fails. *Mind and Language*, 21(3), 360-378.
- Glucksberg, S., & Keysar, B. (1990). Understanding metaphorical comparisons: Beyond similarity. *Psychological Review*, 97, 3-18.
- Glucksberg, S., & Keysar, B. (1993). How metaphors work. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 401-424). New York, NY: Cambridge University Press.
- Glucksberg, S., & McGlone, M. S. (1999). When love is not a journey: What metaphors mean. *Journal of Pragmatics*, 31, 1541-1558.
- Glucksberg, S., McGlone, M. S., & Manfredi, D. (1997). Property attribution in metaphor comprehension. Journal of Memory and Language, 36(1), 50-67.
- Grady, J. E., Oakley, T., & Coulson, S. (1997). Blending and metaphor. In R. W. Gibbs, Jr. and G. J. Steen (Eds.), *Metaphor in cognitive linguistics* (5th ed., pp. 101-124). Amsterdam, Netherlands: John Benjamins Publishing Company.

Graesser, A., Long, D., & Mio, J. (1989). What are the cognitive and conceptual components of humorous texts? Poetics, 18, 143-164.

- Haught, R. (2013). A tale of two tropes: How metaphor and simile differ. Metaphor and Symbol, 28(4), 254-274.
- Holyoak, K. J., & Thagard, P. (1989). Analogical mapping by constraint satisfaction. *Cognitive Science*, 13(3), 295-355. Retrieved from https://doi.org/10.1016/0364-0213(89)90016-5
- Jones, L., & Estes, Z. (2006). Roosters, robins, and alarm clocks: Aptness and conventionality in metaphor comprehension. *Journal* of Memory and Language, 55, 18-32.
- Keane, M. T., & Brayshaw, M. (1988). The incremental analogy machine: A computational model of analogy. In D. Sleeman (Ed.), *European working session on learning* (pp. 53-62). London: Pitman.
- Keane, M. T., Ledgeway, T., & Duff, S. (1994). Constraints on analogical mapping: A comparison of three models. *Cognitive Science*, 18(3), 387-438. Retrieved from https://doi.org/10.1016/0364-0213(94)90015-9
- Kovecses, Z. (1988). The language of love. Lewisburg, PA: Bucknell University.
- Lai, V., Curran, T., & Menn, L. (2009). Comprehending conventional and novel metaphors: An ERP study. *Brain Research*, 1284, 145-155.
- Lakoff, G. (1993). The contemporary theory of metaphor. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 202-251). New York, NY: Cambridge University Press.
- Lakoff, G., & Johnson, M. (2003). Metaphors we live by. Chicago, IL: The University of Chicago Press.

- Miller, G. A. (1993). Images and models, similes, and metaphors. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 357-400). New York, NY: Cambridge University Press.
- Ortony, A. (1979). Beyond literal similarity. Psychological Review, 86(3), 161-180.
- Ortony, A. (1993). Metaphor, language and thought. In A. Ortony (Ed.), *Metaphor and thought* (2nd ed., pp. 1-18). New York, NY: Cambridge University Press.
- Reddy, M. J. (1979). The conduit metaphor: A case of frame conflict in our language about language. In A. Ortony (Ed.), *Metaphor and thought* (1st ed., pp. 284-324). Cambridge, UK: Cambridge University Press.
- Richard, I. A. (1936). The philosophy of rhetoric. New York, NY: Oxford University Press.
- Searle, J. (1979). Metaphor. In A. Ortony (Ed.), *Metaphor and thought* (1st ed., pp. 92-123). Cambridge, UK: Cambridge University Press.
- Sternberg, R. J., & Sternberg, K. (2012). Cognition (6th ed.). Wadsworth: Cengage Learning.
- Sweetser, E. (1990). From etymology to pragmatics. Cambridge, UK: Cambridge University Press.
- Thibodeau, P. H., & Durgin, F. H. (2011). Metaphor aptness and conventionality: A processing fluency account. *Metaphor and Symbol*, 26(3), 206-226.
- Tomohiro, T., & Takashi, K. (2012). Relevant/irrelevant meanings of topic and vehicle in metaphor comprehension. *Metaphor and Symbol*, 27(3), 243-257.
- Torreano, L. A., Cacciari, C., & Glucksberg, S. (2005). When dogs can fly: Level of abstraction as a cue to metaphorical use of verbs. *Metaphor and Symbol*, 20(4), 259-274.
- Turner, M., & Fauconnier, G. (1995). Conceptual integration and formal expression. *Metaphor and Symbolic Activity*, 10(3), 183-203.
- Turner, M. (1996a). Conceptual blending and counterfactual argument in the social and behavioral sciences. In P. E. Tetclock and A. Belkin (Eds.), *Counterfactual thought experiments in world politics* (pp. 291-295). Princeton, NJ: Princeton University Press.
- Turner, M. (1996b). The literary mind. Oxford, UK: Oxford University Press.
- Utsumi, A., & Sakamoto, M. (2007). Computational evidence for two-stage categorization as a process of adjective metaphor comprehension. In *Proceedings of the Second European Cognitive Science Conference* (EuroCogSci2007; pp. 77-82). Delphi, Greece.
- Utsumi, A., & Sakamoto, M. (2011). Indirect categorization as a process of predicative metaphor comprehension. *Metaphor and Symbol*, 26(4), 299-313.
- Zharikov, S. S., & Gentner, D. (2002). Why do metaphors seem deeper than similes? In W. D. Gray and C. D. Schunn (Eds.), Proceedings of the 24th Annual Conference of the Cognitive Science Society (pp. 976-981). Fairfax, VA: George Mason University.

| High typicality/high-apt | High typicality/low-apt |
|------------------------------------|---------------------------------------|
| Dream flies (夢想飛翔) | Knowledge flies (知識飛翔) |
| Brain is exploded (腦袋爆炸) | Economic is exploded (經濟爆炸) |
| Memory goes shortcut (記憶短路) | Story line goes shortcut (劇情短路) |
| Life flies and dances (生命飛舞) | Resource flies and dances (資源飛舞) |
| Politics applies cosmetics (政治化妝) | Youthfulness applies cosmetics (青春化妝) |
| Earth is recovered (地球康復) | Mobile phone is recovered (電話康復) |
| Brain is rusted (大腦生銹) | Creativity is rusted (創意生銹) |
| Love is blossoming (愛情盛開) | Stock market is blossoming (股市盛開) |
| Technology is malfunctioned (科技故障) | Earth is malfunctioned (地球故障) |
| Resource is evaporated (資源蒸發) | Ice-cream is evaporated (雪糕蒸發) |

Appendix A

Appendix B

| Low typicality/high-apt | Low typicality/low-apt |
|-------------------------------|---------------------------------|
| Life boils (生命沸騰) | Sound of the heart boils (心聲沸騰) |
| Dream goes moldy (夢想發霉) | Youthfulness goes moldy (青春發霉) |
| Mood sinks down (心情下沉) | Technology sinks down (科技下沉) |
| Youthfulness is wilted (青春枯萎) | Car is wilted (汽車枯萎) |
| Memory swims away (記憶游走) | Business swims away (生意游走) |
| Family is crumbled (家庭瓦解) | Story plot is crumbled (劇情瓦解) |
| Love poisons (愛情中毒) | Mind poisons (思想中毒) |
| Society is closed (社會封閉) | Life is closed (人生封閉) |
| Career is collapsed (事業倒塌) | Politics is collapsed (政治倒塌) |
| Mind surges (思想澎湃) | Charisma surges (魅力澎湃) |

Appendix C

20 priming pictures





| 参加者编號 : | | |
|----------------|--|--|
| 日期: | | |
| 20 + 15 = | | |
| 45 + 77 = | | |
| 55 - 40 = | | |
| 98 - 49 = | | |
| 6 x 15 = | | |
| 18 x 63 = | | |
| 96 / 4 = | | |
| 224 / 8 = | | |

Appendix D