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An Analysis of Influential Factors of Semantic Inferences

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***Abstract*—Based on whether the given information will be integrated or not, semantic inferences are classified into bridging inferences and elaborative inferences. Moreover, studies on the influential factors of semantic inferences show that semantic inferences are not only affected by contextual constraints, but also closely related to processing strategies.**

Keywords—bridging inferences; elaborative inferences; influential factors; working memory capacity

I. INTRODUCTION

Semantic reasoning is an increase in the reader's conscious or unconscious information about the known information in the text. It is a link between the input information and the information stored in the long-term memory. It also enriches the special process of memory representation of new information (Gui Shichun, 2000). In the past, the classification of semantic reasoning has been confined to two large categories of classification (Van BenBroek, 1994), but there is little research on further classification of these two categories. But with positron emission tomography (PET), functional magnetic resonance imaging (FMRI) and other functional nerves with the emergence of image technology, researchers also produced more research on the influencing factors of semantic reasoning.

II. CLASSIFICATION OF SEMANTIC REASONING

Van Den Broek (1994) classifies semantic reasoning into bridging inferences and elaborative inferences. Bridging reasoning means that readers generate new reasoning information from known information, and this new reasoning information is obtained by integrating known information in different forms. The addition of reasoning also generates new reasoning information from known information, but these new reasoning information is not a simple integration of known information. For example:

(1) Murray poured water on the fire. The fire went out.

(2) John let the tomato soup cool off for a while. Then he ate it.

In example (1), "the water extinguished the fire" can be induced. The three pieces of information in extinguishes fire "are semantically integrated without any new information outside the context, so "water extinguishes fire" acts as a bridge of reasoning in these two sentences. In example (2), however, people usually prefer to use spoons to cool the soup, so the reasoning sentence "John used a spoon to eat soup" can be derived. The "spoon" in the inference sentence adds new information for example (2). Of course, the above two kinds of classification can generalize most reasoning phenomena in language, but there are different kinds of reasoning phenomena in bridge reasoning and additive reasoning. For example:

(3) The tired speaker finished his talk and walked over to the chair.

Example (2) and example (3) belong to the category of additive reasoning, but these are two distinct types of reasoning. Example (2) belongs to its subcategory instrument inferences; example (3) belongs to predictive inferences. The following subcategories of bridge reasoning and additional reasoning are explained one by one.

A. Bridge Reasoning

Bridge reasoning is a kind of reasoning for connecting two consecutive statements (Zwaan & Rapp, 2006). Connective reasoning, deductive reasoning and inductive reasoning all belong to this category. Connective reasoning is the most common reasoning in linguistics, which is an automatic process for readers to combine existing information effectively. Example (1) above is Connective reasoning because this reasoning process is rarely available without any effort. For example:

(4) Who ate the bread? — I'm so hungry.

(5) Don't put the meat here! Rats may eat everything to their reach.

In example (4) the reader can easily infer that "I" ate the bread, because reasoning information is an automated process of integrating this information. Similarly, (5) the reader can get the reasoning information "The rats may eat the meat" by simple integration. As an example (1), (4), (5), both of the known information in the two sentences are integrated in a certain way, so both of them are connected reasoning. Deductive reasoning and inductive reasoning are widely used in logic. In recent years, linguists have also widely used it in linguistics. Deductive reasoning is a

Reasoning method, deduces the conclusion about the special situation from the general principle (syllogism is a kind of deductive form); Inductive reasoning is also a method of reasoning, which generalizes general principles from a series of concrete things (Modern Chinese Dictionary, 2002). For example:

(6) — Anyone who is in the stock market is losing money now.

— Oh, my God! I have been in since last year.

(7) — the heating volume of copper and iron increases.

— If the metal is heated, the molecular distance increases, and if the metal molecular distance increases, the volume increases.

In the above example, example (6) can deduce "I am losing money now", and case (7) can infer "metal heating volume increase". They are different from connective reasoning because deductive reasoning and inductive reasoning both emphasize the relationship between information, from individual to general or from general to individual; deductive reasoning and inductive reasoning and link reasoning belong to the same categories because they are all reasoning formed by bridging known information.

B. Addition of Reasoning

Additive reasoning refers to increasing the knowledge activation of the psychological representation of the context described without the need for information integration (Zwaan & Rapp, 2006). The addition of reasoning reflects the relationship between time and order of known information. There is reasoning after known information, there is reasoning before known information, and sometimes reasoning may occur between known information. Backward reasoning is very similar to semantic presupposition, so it can also be called presupposition reasoning. In semantics Let Saeed, 2000 be defined from the truth and falsehood of statements or propositions. The presupposition reasoning or backward reasoning discussed here is considered in terms of space-time concepts. If known information is used as a reference, it is available to derive backward / presupposition reasoning from the left side of known information. For example:

(8)Her husband is a fool.

(9) I do regret leaving London.

In example (8), only after the presupposition of "She has a husband" does the "Her husband is a fool" make sense, that is, the inference sentence is on the left of the known information. Similarly, the reasoning sentence "I left London" in example (9) is also on the left of known information. Forward reasoning (forward inferences) refers to reasoning made through prediction of known information or natural implication. The reasoning made on the prediction of known information is called predictive reasoning; the inference to the natural implication of known information is called implication reasoning (entailment inferences). For example, "the dirty child", "went toward the bath room", and "turned on the water" in example (10) are easy to predict "The child was going to take a shower." However, example (11) contains the inference sentence "I bought" An animal today". Whether it is predictive reasoning or implicative reasoning, they are generated after known information; spatially, they are located on the right side of known information.

(10) The dirty child went toward the bath room and turned on the water.

(11) I bought a dog today.

An instrument inference refers to the inclusion of specific tools to process known information in the process of reasoning. The word "spoon" in example (2) is the new information derived from reasoning, because people usually like to use "spoon" when they drink soup. Tool reasoning does not necessarily have to integrate known information, but must be added based on known information. The difference between tool reasoning and backward reasoning and forward reasoning is that the former is the addition of known information, but not necessarily the integration of known information. Another example:

(12) After a few days' delay, the paper was finally finished today.

(13) The one-leg man is walking toward us.

Because the "write" and "paper" in example (12) are two piece of important known information, it is decided that the writing tool can only be a pen or a ballpoint pen. Thus it is possible to make a tool inference that the speaker has finished writing with a pen or a ball pen. In example (13), the same sample can be inferred from "one-leg man" and "walking" to "The one-leg man is using a stick to help him walk".

III. INFLUENCING FACTORS OF SEMANTIC REASONING

In the process of reasoning, the factors that can affect the relationship between known information and reasoning are the key to the study of reasoning, because these factors can make some reasoning difficult. (Tang Huilin & Liu Chang, 2004) the same is true of semantic reasoning, and these factors may lead to many different reasoning results based on known information. These factors are explained below.

A. Contextual Limitations

Different contexts produce different inferential cues, so readers may come to different inferences. Cook et al. (2001) points out that in semantic reasoning, different contexts will produce different reaction times for the same information. The context favorable to known information takes less time to produce reasoning than when it is unfavorable; it also points out that different contexts produce different reasoning. Calvo (2000) also found that context plays an extremely important role in the process of reasoning. If some topics about computers are mentioned before example (12), it is easy for the reader to make such reasoning as "the speaker writes a paper through the computer"; however, if you are talking about a pen or a ballpoint pen before, for example

(14), the inference message is "the speaker finished the paper with a pen".

(This pen is very difficult to write. It is very slow to write.) The paper was late for a few days and was finally finished today.

B. Processing Strategies

Allbritton (2004) states that processing strategy refers to the way that the reader decodes known information, such as using a top-down) or a top-down strategy, or linear processing or hierarchical processing and so on. These different strategies will also produce different reasoning results or different reasoning reaction times. Allbritton's three experiments to measure the response time of detecting words provide evidence for the production of predictive reasoning in narrative discourse reading. He asked the subjects to read articles that produced predictive reasoning. Following the known information, the lexical judgment detection words related to predictive reasoning are presented. The results show that the response time of detection words related to inference is shorter, but this advantage is only found in reading task which stimulates predictive reasoning with a reading strategy. These results show that reasoning depends on the processing strategies used.

IV. CONCLUSION

On the basis of the classification of semantic reasoning in the past, combining the linguistic phenomena of Chinese and English, the bridge building reasoning is further divided into three categories: connective reasoning, inductive reasoning and deductive reasoning. Additional reasoning is further divided into presupposition reasoning, tool reasoning and forward reasoning, and forward reasoning is divided into predictive reasoning and implication reasoning. However, the research on the influential factors of semantic reasoning shows that these reasoning are not only influenced by cognitive psychological factors, but also closely related to some concepts in linguistics.

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