Metaphor, Text Length, and On-line Comprehension of the Concluding Idea in Chinese Texts*

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Twelve passages were written in Chinese as experimental texts. Each text contained two parts, a context and a concluding statement. Short contexts were derived from the long contexts, each preceding a concluding statement which induced literal or metaphorical interpretation. Subjects read the context and judged whether the concluding idea adequately described what the text led to. The design was a 2 x 2 x 2 factorial with reading ability, context length and literal/metaphor condition as the between-subjects factors. In terms of comprehension results, higher scores were obtained on the literal rather than the metaphor tasks, on the long rather than the short contexts, and by the good rather than the poor readers. An interaction effect between task type and context length was also significat, with the worst performance being observed in subjects in the short context, metaphor task condition. Regarding response latencies, there was a significant effect on context length , although not on task type or reading ability level. In general, these findings support the schema model in metaphoric processing.

本研究以十二篇中文文章作為測量工具。每篇分兩部分：內文及結論句。內文部分亦分長內文及短內文，而結論句分文意句和喻意句。受試者需讀內文，然後判斷結論句是否由內文意義引申而成。本研究為一 2×2×2 多元設計，以閱讀能力、內文長度、結論句性質為自變項，反應時間及答對率為隨變項。就答對率而言，文意句比喻意句成績較高；長內文比短內文較優；而高能力學生亦比低能力者優勝。文意或喻意與長文或短文兩變項相互影響，以短內文及喻意句的組別表現最差。就反應時間而言，長內文比短內文反應快，但結論句是文意或喻意，學生閱讀能力高或低均與反應速度無關。整體而言，文意與喻意認知影響答對率而不影響反應時間，這結果可支持智略認知的說法，該說法認為文意與喻意認知均是一階段完成，而喻意認知是無需兩階段認知來完成的。

Comprehending a discourse involves determining both the structural relationship among ideas and their relative importance in the context of a discourse. Skilled readers may anticipate the concluding idea of a discourse prior to the end of the text processing. Research findings have shown that knowlege of the thematic formation aids text processing both at the time of encoding and at retrieval (Englert & Heibert, 1984; Kieras, 1981). Readers have to use contextual cues to tie together the input information and organize the text themes – the macrostructures. These mental strategies used in building macrostructures are referred to as macrorules in van Dijk and Kintsch's model (1983). Performing the macrorules involves a series of mental transformations, such as deleting, generating, combining, inferring and organizing. Past studies have found that contextual support and coherence facilitates text comprehension, metaphoric processing, and macroorganization (van Dijk & Kintsch, 1983; Ortony, Schallert, Reynolds, & Antos, 1978; Siu, 1986; Williams, 1984).

This study focuses on how individual differences, metaphoric expression, and text length affect the on-line processing of the macrostructures in short passages.

Reading ability is supposed to interact with context information to influence text processing. Readers' sensitivity to contextual cues is expected to affect their performance in processing and organizing the ideas in a text. Meyer, Brandt and Bluth (1980) reported that ninth-grade poor readers performed worse than average and good readers on immediate and delayed recalls of text information, due to their inability to use organizational strategies; however, their performance improved on texts with a 'with-signals' condition. Similar results were observed in a study by Taylor (1980) in which superior recalls from good readers in an immediate recall condition were attributed to their better use of the passage's top-level structure. Englert and Heibert's data (1984) provided additional evidence, showing that third-grade good readers were more sensitive than average and poor readers to recognize the se-

quence and enumeration text, and use this knowledge to discriminate the relevence of incoming information during reading. Studies on the use of story schema at subsequent retrieval (Rahman & Bisanz, 1986; Short & Ryan, 1984) also reported differences in ability between good and poor readers to recall and reconstruct the story information. There is also evidence that good readers are more efficient than poor readers in utilizing text signals and in integrating topic structures on verification tasks (Lorch, Lorch, & Mogan, 1987). Success in identifying contextual cues, and hence the text theme, depends greatly on the reading ability of individual readers.

A distinction is also made between whether the macroidea is literally or metaphorically expressed in texts. Considerable research has been conducted to investigate the differential processes required in the comprehension of metaphor and the equivalent literal material (Gludksberg, Gildea & Bookin, 1982; Ortony, 1979; Ortony, Schallert, Reynolds & Antos, 1978; Reynolds & Schwartz, 1983; Tourangeau & Sternberg, 1982; Verbrugge & McCarrell, 1977). Two models have been proposed to account for how metaphors are understood in a text. The stage model suggests that metaphor comprehension may be accomplished in two stages: First, the metaphor is interpreted literally and this interpretation is rejected as deviating from the context; then it is reinterpreted and a search for non-literal meaning is triggered. One implication of this approach is that comprehending the non-literal meaning requires more time and effort than comprehending the literal meaning. Verbrugge and McCarrell (1977) generalized from their studies that a reinterpretation stage was evident as additional inferences were needed to induce the 'ground' of a metaphor in forming the basis for the metaphorical recall. A study by Yarbrough and Blaubergs (1980) showed that due to additional mental effort invested in metaphoric understanding, metaphorical sentences were recognizable more often than literal ones on a subsequent rcognition task. The two stage model also gained support from an experiment by Yarbrough & Gagne (1987), which showed that greater cognitive capacity was required to solve the metaphors in a technical text, thus facilitating the recall of the metaphor-related ideas on a free recall task.

The schema model, however, assumes that both literal and metaphorical expressions can be readily understood by readers if schematic expectations can be generated from the context to guide them through the comprehension processes. This model was first tested in an experiment by Ortony et al. (1978). Their data substantiated the prediction that metaphorical statements were comprehended at essentially the same speed as literal ones when preceded by long contexts. Gerrig and Healy (1984) discovered that the response latency was significantly shorter in the context-first metaphor-next condition than the metaphor-first context-next condition, thus confirming the adequacy of the schema interpretation. The equal processing hypothesis in the schema model was challenged, however, by Reynolds and Schwartz (1983) who found contradictory results when replicating Ortony et al.'s study on a recall measure. They argued that, despite the similarity in response speed, the nature of the processing itself might still be different during interpretion of the literal and metaphorical meanings, and this might account for the increased facility in the recall of the metaphorical sentences.

Context length is also found to interact with the metaphorical task, eliciting different response latencies. Ortony et al. (1978) found that processing time interacted between literal/metaphor text and context length. Longer processing times were used to interpret the metaphorical statements when preceded by short contexts and no effect due to the metaphor/literal condition was observed when preceded by long contexts. In the present study, the experimental passage consisted of two parts, an antecedent context and a concluding statement. The context was either long or short; the short context was formed by simply deleting the last sentence from the long context. Shortening the context in this way is supposed to weaken the invoked schema and hence judgemental performance.

The literal/metaphor variable was manipulated in a different way from that of the study by Ortony et al. (1978) in which the antecedent contexts were altered to manipulate the literal/metaphorical interpretation of the concluding sentence. In this study, the context was kept intact but the macrostatement was altered to produce the literal/metaphor variation. It is reasoned that the alteration of the macrostatements rather than the contexts is an adequate and easily-controlled device to test the equal/differential hypothesis in metaphoric processing. In coming to a judgment, some subjects might succeed or fail to recognize the metaphorical meaning without conscious effort, or feel confused but try to apprehend it through recontructive processes. The schema model would then be justified in the light of the former case whereas the stage model would be applicable in the latter case. Some text samples are given below:

1. *Long Context*. He was appointed to settle the dispute between the employer and the employees. He had to identify the source of

the conflict and negotiate between them, and be careful not to irritate either the employer or the employees.

2. *Short Context*. He was appointed to settle the dispute between the employer and the employees. He had to find out the source of the conflicts and negotiate between them.

3. *Concluding Statement* (for both long and short contexts). He was cautious about not hurting the feeling of either party (literal meaning). He was behaving like one who walks on a tight rope in the air (metaphorical meaning).

他被委任為資方和勞方的調停人，調停兩方的紛爭。他需要找出衝突的原因而和雙方談判。他不可開罪資方或觸怒勞方，現在㈠他極需小心從事避免犯錯（文意）；㈡他像在空中踏鋼線的人（喻意）。

Method

Subjects

Subjects were 152 9th-grade students drawn from three subsidized coeducational schools in Hong Kong. They were of average standard in terms of their results in a public examination taken on the middle of 9th grade. The sex distribution was well balanced, there being 49% male and 51% female students.

Design

Each subject was assigned randomly to read 12 passages. The design was a 2 x 2 x 2 factorial with task type (literal vs. mathphor), contextual length (long vs. short) and reading ability (good vs. poor) as between-subjects factors. The dependent measures were comprehension latency and performance scores.

Materials

Two sets of passages were devised, with 12 in each set. The passages were written according to the following guidelines: (1) all the written passages were of similar length (within a range of 75-85 Chinese characters), (2) the context was cut short by eliminating the last and important sentence/phrase which provided the most significant clues to the macrostructure, and (3) the concluding statement in the context was altered to induce a literal or metaphorical interpretation. Twenty passages were first written and then pilot-tested with a small sample. Twelve of them were selected on the basis of their discriminative power and level of appropriateness

with respect to the 9th graders. Samples of the experimental texts, translated into English, are given below:

1. *Long Context*. He is an old poet, highly-educated in the Chinese classics. Only on rare occasions, when people with a deep appreciation of classics gather together, will he share his thoughts. He leads a quiet and undisturbed life and never appears in the public.

2. *Short Context*. He is an old poet, highly-educated in the Chinese classics. Only on rare occasions, when people with a deep appreciation of classics are gather together, will he share his thoughts.

3. *Concluding Statement*. He has great talents but refrains from showing them too freely (literal meaning). He gives the impression of a sharp sword enclosed in its sword-sheath (metaphorical meaning).

他是一位詩人，對中國古典文學造詣極高，當一羣崇尚古典文學的文人雅士聚首一堂，他偶而會發表高見。平時他隱居山林過着隱士般的恬靜生活。㈠他天才橫溢，但從不隨便顯露才華（文意）。㈡他像是藏在劍盒裡的一把利劍（喻意）。

The subjects were asked first to read the context and then to judge whether the concluding statement correctly described what the text led to. Long and short versions were prepared for each passage. Of the 12 passages in a set, two were followed by obviously incorrect statements as distractors to guard against the undesirable effect of an acquiescent response.

Procedure

The IBM-XT model personal computers were used throughout the experiment. Half of the subjects were randomly assigned to take the long version, and the other half the short version. The literal and metaphor versions were also randomly administered to subjects. The sample was further divided into high-ability and low-ability groups on the basis of the Chinese Reading Test administered each year to ninth graders as a standard measure of reading ability in Chinese. The score distributions were grouped among 6 levels from A through F, those with level C or above being classified as good readers, and those under level C as poor readers.

Subjects first completed a vocabulary recognition test through which they were made familiar with

the testing procedure. Detailed instructions were given before each task. Passages were presented one at a time on the VDU with all contexts arranged with 35 characters to a line and at the same horizontal positon. A context stayed on the screen exactly 8 seconds before disappearing automatically. A target statement appeared immediately after each context with subjects being asked to judge whether this correctly summarized the preceding context. They had to press either 'M' key for 'yes' or 'N' key for 'no'. As soon as the subject made a response, the statement was removed and new context appeared. This sequence was repeated for the entire set of experimental texts. Response time was measured from the appearance of the target statement until the subject pressed either the 'M' or 'N' key. Two measurements were then derived from the responses: Subjects' comprehension scores in terms of the number of correct answers, and response times measured in 10 millisecond units. Subjects had sufficient time to read the passage context, i.e. at the rate of about 10 characters per second. They were aware that their response time was being recorded.

Results

On-line Comprehension Results

Each subject read 12 passages of either long or short context, followed by either a literal or a metaphorical statement. An analysis of variance (ANOVA) was conducted to determine the significant differences and the interactions among the experimental factors. Means and standard deviations of the on-line comprehension scores are summarized in Table 1.

The F ratios obtained form the analysis of the comprehension scores were found significant for all three main factors, the reading ability, F (1,144) = 6.20, $p < .02$; the task type, F (1,144) = 21.89, $p < .001$; and the context length, F (1,144) = 6.66, $p < .01$. Follow-up analyses were performed to determine where the interation effect was located. The results showed that the effect due to the literal/metaphor factor was not significant in the long context condition but was highly significant in the short context condition, favoring the literal task, F (1,72) = 29.45, $p < .001$. Furthermore, the analysis of the effect due to context length yielded a non-significant result for the literal task but showed a significantly better result in the long rather than the short context for the metaphoric task, F (1,75) = 12.60 $p < .001$. This demonstrated that the poor performance of the students on the metaphoric task when preceded by a short context probably accounted for the interaction

TABLE 1

Mean Scores of On-line Comprehension Task as a Function of Experimental Condition

Condition	High Ability			Low Ability		
	n	M	SD	n	M	SD
Literal Task						
Long Context	23	9.87	1.77	16	9.20	1.46
Short Context	26	9.65	1.83	11	9.25	1.12
Metaphoric Task						
Long Context	28	9.25	1.84	12	8.17	2.38
Short Context	19	7.47	1.78	17	7.06	2.25

effect. The present findings clearly indicate that more correct responses were obtained on a literal rather than on a metaphoric task, in a long rather than a short context, and by good students rather than poor ones. A short context followed by a metaphorical target seems to cause the most interference with subjects' performance on an on-line comprehension task.

Response Time Results

A separate three-way ANOVA was conducted on response times. Table 2 presents the means and standard deviations in terms of the experimental factors:

TABLE 2

Mean Response Times (in sec) as a Function of Experimental Condition

Condition	High Ability			Low Ability		
	n	M	SD	n	M	SD
Literal Task						
Long Context	23	2.98	1.53	16	2.87	1.29
Short Context	26	3.52	1.56	11	4.06	1.68
Metaphoric Task						
Long Context	28	3.41	1.63	12	2.84	1.53
Short Context	19	4.05	1.76	17	3.88	1.38

Inspection of the analysis results revealed that only the contrast between context length was found to be significantly different, favoring the long context condition, $F(1,144) = 8.63$, $p < .01$. Neither of the two main factors, task type and reading ability, nor the interaction effects yielded a significant F ratio. Thus, the short contexts, irrespective of the task type and reading ability, tended to demand higher response latencies than did the long contexts. The response times on the on-line comprehension test were not affected by the literal or metaphoric task nor by the reading ability of individual students, although they were affected by the context length that preceded the concluding statement.

Discussion

Individual differences in reading ability did have an impact on comprehension performance but had no influence on the response latencies. These results concur with the previous findings by Englert & Heibert (1984) and Lorch et al. (1987). The data in present study indicate that the poor readers made more incorrect responses on the comprehension tasks than the good readers although both groups responded at essentially the same speed. One possible interpretation is that schematic expectations invoked by the poor readers were inappropriate to guide them to make a correct judgment. It is contended that good readers are more sensitive to contextual cues and more efficient at utilizing cognitive strategies to abstract macroideas than poor readers on either literal or metaphoric tasks with long or short contexts. This contention is consistent with the study by Britton, Muth, & Glynn (1986), in which they observed that when processing time was controlled, individuals might allocate different cognitive effort and organiztional strategies in their attempt to construct the macrostructures.

The significant effect on context length indicates that subjects made more mistakes and took longer to come to a judgment on short contexts. The effect due to context length was fairly consistent for the comparisons on both performance and latency measures. The macrostructure generated from the short context was insufficiently specific to allow as fast and correct judgments as were derived from the long context. The omission of the last sentence in the context reduced the context support, and thus entailed the activation of loose and defective schemata and resulted in longer and weaker processing. For both good and poor readers alike, the last part of the context would formulate the important and significant links to invoke the proper schemata.

A significant effect due to literal/metaphor condition was observed on comprehension scores, but not on the response latencies. Metaphorical statements did not induce significantly longer latencies to respond but did elicit more incorrect responses than literal statements on the on-line comprehension task. In a study by Glucksberg, Gildea, and Bookin (1982), the data obtained supported their prediction that the true metaphorical interpretation might conflict with a false literal interpretation and so slow up response latencies. Their prediction, however, does not concur with the present findings. The interaction between the task type and context length on latency measures reported in the study by Orfony et al. (1978) was not found in this experiment. However, the present study identified the same interaction effect on the performance measure. The subjects in this experiment did not differ either in their response to the literal or metaphor tasks when preceded by long contexts but differed significantly when preceded by short contexts, favoring the literal task group. This indicates that more deficient schemata are generated form the short contexts and metaphor task condition.

In this study, students took a similar amount of time to interpret both the literal and the metaphorical statements, although their performance was poorer on the metaphor task. When faced with a metaphor, subjects tended to disregard the fact that it was a literal alternative and proceeded to interpret it without attempting to undertake any elaborate processing. The comparable latencies spent in response to the literal or metaphoric task does not appear to concur with the 'conflict' interpretation as suggested by Glucksberg et al. (1982). Although the metaphorical statement took no longer to interpret than the literal one, it was taken as a false literal statement more often than the literal task, thus resulting in more incorrect responses in the metaphoric condition. This indicates that the unsuccessful responses were due more to the inability to connect the contextually-induced schema with the metaphoric task than to the lack of reconstructive processes, as implied in the stage model. Furthermore, the longer latencies spent on the short context condition did not produce any improvement in the performance scores, particularly in the short context, metaphor task condition. In terms of performance measure, more time spent on the judging task did not help to restore the schematic information omitted from the impoverished context. This points out that the loose expectations generated from the short context appeared particularly weak to cope with the metaphorical representation. The data from the performance and latency measures (Tables

1 and 2) taken together tend to be interpretable on the basis of the schema model as the significant effects due to literal/metaphor condition and to the interaction of task type by context length on the peformance measure seem to better fit the schematic interpretation.

An expression is interpreted metaphorically by virtue of its context. Longer and weaker processing necessarily results from the reduction of the contextual support in the short context condition. Deletion of the last part of a brief discourse has been proven to inhibit significantly the development of a proper metaphorical schema. Different parts of a context may share the importance in their contribution to the understanding of the metaphorical ideas. Little effort has been made, however, to examine the relative importance of the contextual cues distributed among different parts of a text. Future research should aim to determine the differential contributions made by the schematic cues among different parts of the text structure involving metaphoric processing.

When proceeding through a passage, a reader may be guided by the text information to search for the macroideas which may be implicitly embedded in the schematic context. The judgment task required in this study is exactly analogous to the searching or inferring processes inherent in normal reading behavior. Knowledge of the processes involved in organizing the concluding idea in texts and of the factors affecting its organiztation may well lead to a better understanding of reading bebavior in school students.

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