

HANNA K. ULATOWSKA, SANDRA BOND CHAPMAN,  
JULENE JOHNSON, CARMEN BRANCH  
University of Texas at Dallas

## MACROSTRUCTURE AND INFERENTIAL PROCESSING IN DISCOURSE OF APHASIC PATIENTS

Models of discourse comprehension emphasize the roles of textual and extratextual knowledge systems in inferential processing of texts. These knowledge systems were examined by comparing the levels of inferencing in moderately impaired aphasic patients and normal control subjects on gist and moral responses for fables. The responses were further characterized according to pragmatic and semantic aspects. The results revealed a significant reduction in the level of generalization for the aphasic patients as compared to normal controls on the moral responses. However, similarities in pragmatic and semantic strategies were evident between groups. Whereas the aphasic patients approached the tasks similarly to normals, the findings highlight some communicative difficulties in aphasia in comprehension when inferencing from textual to world knowledge is required.

Studies of discourse processing in neurogenic populations seek to elucidate the nature of deficits that occur in the comprehension and production of connected language. Growing evidence documents the need to examine the multiple levels of discourse representation in order to identify specific components of dysfunction (Frederiksen and Stemmer, 1993). Evidence from studies of neurogenic adult populations reveals that communicative ability and disability, as holistic phenomena, do not correspond directly to linguistic competence. For example, despite the preservation of basic linguistic function after acquired right hemisphere lesions in adults, communicative disability is common (Myers, 1993). The reverse pattern is often described for left hemisphere lesioned patients with aphasia. In contrast to right hemisphere patients, aphasic patients manifest impairment of specific linguistic functions with relative preservation of communicative ability (Ulatowska, Stern Doyel, Haynes, and North, 1983; Ulatowska, Allard and Chapman, 1990).

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Recent models of discourse processing suggest that communicative ability may be characterized best by utilizing global information structures, such as macrostructure (Frederiksen and Stemmer, 1993; Myers, 1993; Ulatowska and Chapman, 1994; van Dijk, 1980). Intuitively, macrostructure is identified through notions such as theme, topic or gist of discourse. Theoretically, the macrostructure of discourse is inherently related to coherence and can be used to define the well-formedness of connected language.

The notion of macrostructure was first introduced by Bierwisch (1965) and elaborated by van Dijk and Kintsch (1983, 1977) to characterize specific narrative structures of discourse. Recently, the significance of the construct of macrostructure has become more fully appreciated because of its clinical application in characterizing communicative abilities in clinical populations of brain damaged patients as reported by neurolinguist Huber (1990) in Germany; by neuropsychologists Glosser (1993); Malloy, Brownell and Gardner (1990) in the United States; Joannette and Goulet (1990) in Canada; and by speech-language pathologists Myers (1993), and Brookshire and Nicholas (1993a). The construct of macrostructure has been utilized to examine differences in global and local coherence and to describe heuristic and analytical processing of discourse. Consequently, macrostructure has achieved widespread acceptance because of its explanatory power in accounting for preservation and impairment of discourse coherence across various clinical populations by distinguishing different patterns of disruption in macro- and micro-level processing. Indeed, certain aspects of macrostructure are represented in the recent development of a test of discourse comprehension for aphasic patients, the Discourse Comprehension Test (Brookshire & Nicholas, 1993b).

In addition to the contribution of macrostructure in explaining higher levels of language processing, macrostructure has important clinical advantages due to its semiotic nature. In particular, the construct of macrostructure is suitable for characterizing information structure in a variety of symbolic representations, such as written text, pictures or film strips. As such, macrostructure can be adopted to examine selective impairments that have been reported in visual or auditory modalities.

In general, the construct of macrostructure reflects higher levels of language processing. Nonetheless, it can also be utilized to evaluate multiple levels of language. This possibility results from the fact that macrostructure is derived from two-directional processing, i.e., bottom-up and top-down. Macrostructure involves bottom-up processing since it is based on the individual units of information (propositions) that comprise the semantic content of the text (Kintsch & van Dijk, 1978). From a top-down direction, macrostructure is represented in inferential processes that allow comprehenders to interpret discourse at various levels of generalization.

The range in the levels of generalization vary from a concrete level, based primarily on the explicitly stated information, to a more abstract level of interpretation based on knowledge sources outside the explicit text. Specifically, macrostructure can be expressed at different levels of generalization that reflect a system of inferencing that allows one to bridge new information (textual) with old information (world knowledge) in the comprehension and production of discourse.

Inferential processes are highly constructive and recursive, utilizing both cognitive and linguistic resources to achieve discourse cohesion and coherence. The recursive nature of macrostructure is evidenced by the fact that the same text can be represented by multiple macrostructures that vary in level of abstractedness and generaliza-

tion. For example, application of macrostructure fable (a specific narrative genre) may be manifested in 1) a summary of the fable, 2) the gist of the fable, or 3) the lesson of the fable given in the form of a proverb, to mention a few. Clearly, these macrostructure tasks illustrate increasingly greater demands on inferencing and generalization. A summary can be formed using primarily textual inferences, as contrasted with a proverbial lesson, which involves considerable inferencing of textual and world knowledge systems.

Nonetheless, all the tasks of macrostructure exemplified above (i.e., summary, gist, proverbs) invoke transformations of the same textual context. It is important to note that there is an upper limit to the level of abstractedness that is acceptable in order to maintain a representative macrostructure. For example, a text macrostructure may be too global or general to be useful because of vagueness or lack of specificity in representing the global meaning of the original text. Vague responses occur due to various underlying mechanics (i.e., some cognitive and some linguistic) and are seen in both aphasia and dementia.

At present, the clinical interest in macrostructure is increasing because of its potential in modeling discourse comprehension and production, in characterizing complex cognitive tasks (e.g., problem solving), and in elucidating visual processing abilities. Moreover, macrostructure has relevance to examining the rules of communicative cooperativeness as defined by Grice (1975). In particular, the theoretical construct of macrostructure can help clarify the quantity and quality and relevance of discourse and can be used to verify the traditional methods in identifying topics and subtopics of discourse.

This paper examines comprehension of narrative discourse in aphasia by utilizing the construct of macrostructure. As indicated above, macrostructure provides an organizational framework for narrative information. This framework appears to play an integral role in explaining how narratives are encoded and retrieved from memory (Seifert, 1990). In particular, this study characterizes the type of inferences generated by aphasic patients as compared to normal controls on macrostructure tasks with different inferencing requirements. Discourse comprehension relies on the listener's ability to make inferences across different processing sources. The two most important sources include the explicit textual content and the extratextual source of real world knowledge. The question raised by this study is whether aphasic patients exhibit differences in the levels of inferences generated on retrieval tasks tapping depth of comprehension. The hypothesis is that the aphasic patients will have difficulty in inferencing tasks that require connecting the explicit story content with generalized real world knowledge. The tasks utilized to tap different levels of inferencing involve specifying the main idea (gist) and deriving a moral for a particular genre of narrative, i.e., fables.

The first part of the paper describes a study comparing aphasic and normal control responses on gist and moral probes for fables. While the group response patterns are interesting, the major focus is on the significance of the methodology for differential diagnosis. Therefore, the final portion of the paper highlights commonalities and distinctions between aphasic patients and normal controls in inferencing as reflected in the pragmatic and semantic domains of language processing. It is at this level of interpretation that diagnostic procedures can direct individualized therapeutic goals.

## Levels of inference in gist and moral responses

### Stimuli and Rationale

The narrative stimuli consisted of 2 pictured stories and 6 verbal fables (Appendix). Fables are a genre of narrative developed to teach a lesson that may apply to a number of situations encountered in everyday life. They serve a unique sociological function as indicated by their preservation from generation to generation without losing their intrinsic value. Fables convey general truths regarding cultural principles of appropriate behavior. From a methodological perspective, fables are an appropriate genre for use across the age span (from pediatric to elderly adult populations) since fables represent situational problems familiar to all age groups.

From a theoretical perspective, fables provide a unique measure of inferencing ability using intratextual and extratextual sources. Typically, the deep meaning of a fable revolves around a central lesson that must be inferred since the lesson is not explicitly stated. In order to understand the deep meaning or lesson of a fable, the listener must build inferences between the explicit textual information (intratextual) and knowledge of the world (extratextual) (Graesser & Bower, 1990; Ulatowska, Sadowska, Kordys & Kądziaława, 1993). Making inferences between intratextual and extratextual knowledge represents an essential stage in normal discourse processing. The inferences can be expressed at different levels of generalization. The specific tasks utilized in this study to examine inferencing abilities are described below.

### Tasks

The tasks used to investigate comprehension of the fables and inference constructions included: 1) retelling the fable, 2) summarizing the fable, 3) identifying the main character with justification, 4) giving the main idea or gist, 5) deriving a moral, and 6) providing a title for the fable. For purpose of this paper, only responses for the gist and moral task were analyzed since these two tasks appear to be the most revealing in examining depth of comprehension (Ulatowska & Chapman, 1994; Ulatowska, Chapman & Johnson, 1999).

The subjects were presented the stories in printed form so they could follow along as the examiner read the fable. In all cases, the subject was given as much time as needed to study the stimulus. When the subject was ready to begin, the stimulus was withdrawn. The subject was then asked to give a response on tasks varying in the amount of inferencing required. The subjects' responses were audio-recorded, transcribed verbatim, and checked for errors by an editor.

#### *Gist Task*

Deriving the gist of a fable requires the processing of the most important idea or point of the story. There is a wide range of acceptable variability in the level of generalization for gist responses. For example, a gist response can either be concrete (involving primarily textual information) or more abstract and generalized (involving world knowledge). A more concrete gist of a story may be represented by an abbreviated summary in which the characters, main event, and outcome are mentioned. This type of gist response contains primarily explicit information from the story content, although some inferencing within the textual information may be apparent. At a more generalized abstract level, the gist can be expressed in the form of a lesson. In order to produce a gist in lesson form, the individual must make infer-

ences using a number of sources, i.e., the textual information, the theme, and the inherent lesson of the story. This more generalized type of gist response suggests inferencing between the textual information and information from real life situations.

#### *Moral Task*

As stated previously, the deep meaning of a fable is reflected in the moral or lesson of the particular fable. Typically, the fable's didactic lesson is not explicitly stated in the story content. Rather, a lesson must be inferred from the actions of the character. As is common in fables, the main character uses practical intelligence to carry out a plan to achieve his goal, often using deceit or trickery. The character, who „loses out” as a result of the scheme, learns a lesson. What is interesting about most fables is that the lesson can be perceived from two different perspectives, i.e., from the winner's perspective of doing the trick or the loser's perspective of being tricked.

More importantly, the fable's lesson can be interpreted at two levels that show different types of inference processing. At a more concrete level, the lesson is derivable at an intratextual level involving primarily content-based inferences. An intratextual lesson applies to the specific characters of the story. At a more abstract level, the lesson is generalizable to a broader situational context through making inferences between the explicit textual information and real world knowledge (extratextual sources). This more generalized lesson reflects a general truth regarding widely accepted values of the cultural system characterizing the way people should behave or the behaviors people should avoid (e.g., beware of flattery, avoid people with false pretenses, never boast). Whereas a concrete lesson based primarily on the intratextual information may be correct, it suggests limitations in inferential processes. In contrast, a generalized lesson/moral based on the content suggests facility in building inferences between explicit stimulus content (intratextual) and knowledge of the world (extratextual)

#### **Subjects**

Fifteen aphasic patients and fifteen normal control subjects who participated in a larger investigation on discourse processing in adult populations were selected for this study. The normal control and aphasic subjects had similar demographic features. They were comparable in age, gender, race, handedness, marital status, and occupational level. No subject resided in an institutional setting. Their demographic profiles are summarized in Table 1.

Table 1. Subject demographics

		<b>Aphasics</b>	<b>Controls</b>
<b>Age</b>	Mean	62.5	60
	Range	46-71	47-76
<b>Sex</b>	Male	10	6
	Female	5	9
<b>Education</b>	Mean	14.7	16.2
	Range	12-18.5	14-20

Table 2. Aphasics' performance on standardized language tests

Test	Possible Points	Mean	Range	SD
<b>Severity Rating*</b>	5	3.27	2.5-4.0	.62
<b>Auditory Comp.*</b>				
Discrim	72	70	64-72	2.88
Body/Command	35	16	10-20	3.21
Complex idea	12	11	4-12	2.25
<b>Reading Comp.*</b>				
Words	30	26	10-30	7.40
Sent/Para	10	9.5-10	5-10	1.39
<b>Boston Naming Test</b>	30	26	17-30	3.27

\*Selected subtests from the *Boston Diagnostic Aphasia Examination (BDAE)* (Goodglass & Kaplan, 1983)

Table 3. Aphasics' and normal controls' performances on cognitive tests

Tests	Aphasics	Controls
<b>WAIS-R*</b>		
<b>Picture Arrangement</b>		
Mean	9	12
Range	3-16	7-18
SD	3.24	3.25
<b>Block Design</b>		
Mean	9	11
Range	4-12	6-16
SD	2.31	2.97
<b>Similarities</b>		
Mean	9	14
Range	5-15	11-17
SD	2.59	1.50
<b>Raven's CPM**</b>		
Mean	19	21
Range	5-15	17-24
SD	3.77	2.13
<b>Wechsler***</b>		
Mean	18	28
Range	8-30	18-45
SD	6.33	7.82

\**Wechsler Adult Intelligence Scale – Revised*

\*\**Raven's Coloured Progressive Matrices*

\*\*\**Wechsler Memory Scale*

All subjects had relatively good comprehension as demonstrated by their performance on the comprehension subtests of the Boston Diagnostic Aphasia Examination, (BDAE) (Goodglass & Kaplan, 1983) (Table 2). The fifteen patients were classified as moderately impaired using the severity rating scale of the BDAE (mean = 3.27, range 2.5-4). Cognitive abilities were assessed using three subtests from the Wechsler Adult Intelligence Scale – Revised, (WAIS-R) (Wechsler, 1981), (i.e., picture arrangement, similarities and block design) and using Subtests A and B from the Raven’s Coloured Progressive Matrices (Raven, 1962). As illustrated in Table 3, most of the patients showed relatively preserved abilities on nonverbal cognitive measures.

## Analyses

The subjects’ responses on both the gist and the moral tasks were classified using a dichotomous system of intratextual and extratextual categories. These categories reflected the levels of inferencing according to how much the response adhered to the stimulus

Table 4. Examples of extratextual and intratextual responses on Gist and Moral Tasks

<b>APHASICS</b>	
<b>Gist</b>	
EXTRATEXTUAL	INTRATEXTUAL
<i>Don't be fooled.</i> (Fox and Goat)	<i>If you fall in a well, you'll get out.</i> (Fox and Goat)
<i>Um... If you try to, uh, fool ... people, you end up, uh, fooling the right people and mess the whole thing.</i> (Raven and Pigeons)	<i>Raven is no good. It's a black painting ... white is no good.</i> (Raven and Pigeons)
<b>Moral</b>	
<i>Don't pretend that you can do something when you can't.</i> (Fox and Raven)	<i>Don't let the raven have the cheese.</i> (Fox and Raven)
<i>Thou shalt not steal.</i> (Woman and Doctor)	
<b>CONTROLS</b>	
<b>Gist</b>	
<i>Flattery will get you everywhere.</i> (Fox and Raven)	<i>Fox gets cheese from raven.</i> (Fox and Raven)
<i>Follow directions of the one you trust.</i> (Farmer and Sons)	<i>The main idea is to instill the true meaning of the treasure in the sons by the father.</i> (Farmer and Sons)
<b>Moral</b>	
<i>Don't bite off more than you can chew.</i> (Apple Theft)	<i>They shouldn't have been stealing apples.</i> (Apple Theft)
<i>Don't believe everything you hear.</i> (Fox and Raven)	<i>The raven could have learned not to fall for the flattery.</i> (Fox and Raven)

Figure 1. Extratextual responses on Gist Task for aphasic patients (N=15) and normal controls (N=15) for Picture Sequences and Fables

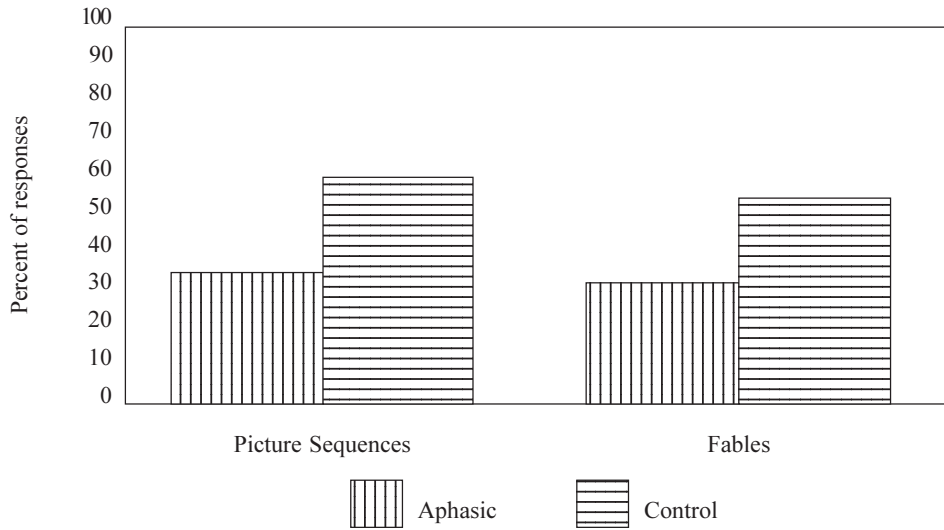
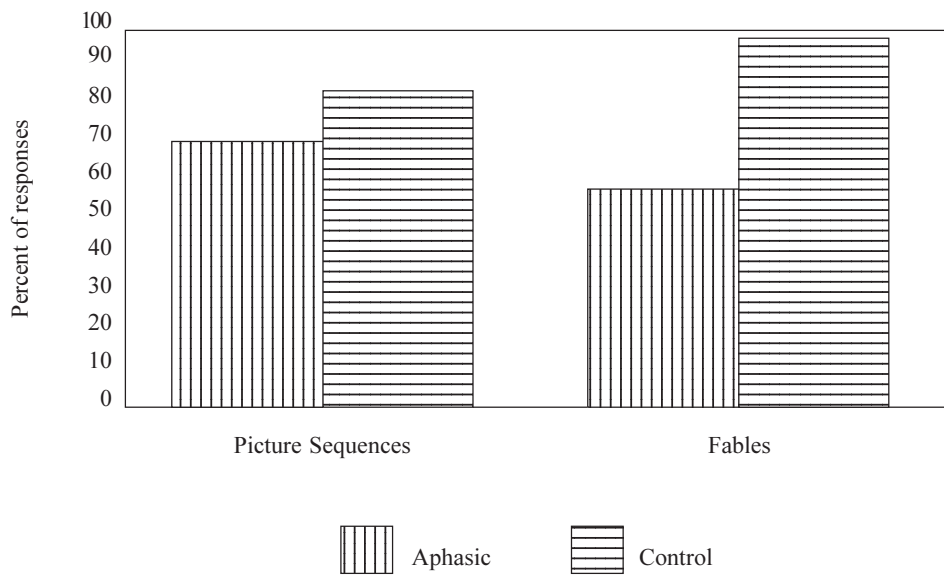


Figure 2. Extratextual responses on Moral Task for aphasic patients (N=15) and normal controls (N=15) for Picture Sequences and Fables





content. Responses coded as intratextual were those in which the information was explicitly stated in the text or involved inferences primarily of a textual nature. In contrast, extratextual responses involved more generalization showing inferential processing using information from the stimulus content as well as world knowledge.

When the subjects gave an intratextual response, probes were given to determine whether the patients could produce an extratextual response. An example of a probe is: „How does that lesson relate to real life situations?“ Table 4 illustrates examples of these two response categories for morals. The assignment of responses to intratextual and extratextual categories was independently determined by two of the authors. When disagreements in coding occurred, they were resolved through discussion by the four authors so that a point-by-point agreement in scoring was achieved.

## Results

### Gist Task

The performance patterns on the gist task for the aphasic and normal control subjects are presented in Figure 1 for the pictured fables and the verbal fables. A Chi-square (or Fisher's Exact test when cell sizes were small) was used to compare the proportions of extratextual responses for the pictured fables and verbal fables between the aphasic and normal control groups. Additionally, odd ratios and 95% confidence intervals were determined. The differences in proportion of extratextual gist responses between the aphasic and normal control groups failed to reach significance for the pictured fables ( $p=0.1172$ ) as well as for the verbal fables ( $p=0.3511$ ).

Additionally, subjects' performances across all fables were examined. That is, the question was raised whether particular stories were more or less likely to elicit an extratextual response. The results of the Chi-square test revealed similar proportions of extratextual responses for normal and aphasic patients on all but two fables, one picture (Fox and Dog) and one verbal fable (Two Roosters). For these two fables, the aphasic patients produced significantly fewer extratextual responses than the normal control subjects (Fox and Dog:  $p=0.008$ ; Two Roosters:  $p=0.028$ ).

### Moral Task

Performance patterns on the moral task are illustrated in Figure 2. In contrast to similar proportions of extratextual responses for aphasic and normal control subjects for the gist task, significant differences were found between the two groups for the moral task. The aphasic group produced significantly fewer extratextual responses than the normal control subjects on the pictured fables ( $p=0.002$ ) and on the verbal fables ( $p=0.0007$ ). The tendency to produce intratextual responses was higher for aphasic subjects as compared to normal control subjects across all stories as reflected in a higher odds ratio. For example, the aphasic subjects were 21 times more likely to produce an intratextual moral for the Fox and Goat fable than the normal controls. While the odds ratio on intratextual responses for all fables was greater for aphasic patients, the lowest odds ratio (2.36 times) was found for the Woman and Doctor fable. To consider whether human characters in fables influenced the nature of responses, the performance of the other fables with human characters ( $n=2$ ) was scrutinized. The other two fables with human characters, i.e., the Farmer and Sons (verbal fable) and the Apple Theft (pictured fable) had comparatively higher odds ratios of 7 times and 4.57 times, respectively, than that

exhibited by the aphasic patients as compared to normal subjects for the Woman and Doctor fable.

The evidence that aphasic patients exhibit a different response tendency from normal control subjects motivates the question as to whether aphasic patients approach the gist and moral tasks the same way as normals. Classifying a response as intratextual or extratextual does not specify whether the response was in a moral form, what the speech act was, from what perspective the lesson was derived, nor the specific nature of the semantic content. Therefore, the next section describes a qualitative characterization of the pragmatic and semantic strategies of aphasic patients in utilizing intratextual and extratextual knowledge systems. It is at this level of linguistic description that individual differences and failures can be identified and explanations for the difficulties determined.

### **Pragmatic and semantic aspects in processing discourse macrostructure**

The qualitative analyses for the aphasic and normal control responses on the gist and moral task involved the following evaluations of the pragmatic and semantic aspects of the response. At a pragmatic level, the responses were classified according to a number of dimensions. The appropriateness of the response on the moral task was determined. For example, an appropriate moral response should be produced in the form of a lesson. Additionally, the lesson responses were classified as to the specific speech act produced, i.e., advice, admonition, or maxim. Advice constitutes a positive suggestion or lesson, whereas admonition constitutes a warning. A maxim expresses an assessment of the situation stated as a generalized truth. Another pragmatic dimension involved describes the patient's response according to the perspective taken in interpreting the lesson. As stated previously, the lesson for most fables can be interpreted from either the winner's or the loser's perspective.

At a semantic level, the subjects' responses were described according to the semantic relationship expressed between the components of the specific speech acts. These relationships are of the following type: causal: (e.g., „Don't brag because you never know what's gonna happen next."), conditional (e.g., „If you use your head, you can get out of a situation.") or temporal, (e.g., „Don't crow around too much before your victory is assured.") Finally, the syntactic form of the speech acts was described in terms of the use of syntactic connectors, such as „if" or „when". These syntactic devices signal important semantic relationships.

### **Results**

The results of the qualitative analyses are reported according to similarities and differences between the aphasic and normal control subjects' response strategies and are summarized in Table 5.

#### *Similarities*

A number of similarities were found between the responses of the moderately impaired aphasic patients and the normal control subjects. Both groups gave appropriate responses to the gist and moral tasks. As a group, both the aphasic and normal individuals maintained comparable response tendencies for the gist and moral tasks as evidenced by similarity in response type. The similarity between groups in moral responses was manifested by a predominance of responses in the form of a lesson. Only one aphasic patient showed difficulty in providing a moral response in the form of a lesson. The similarity in the gist responses was

Table 5. Categories and qualitative analyses for pragmatic and semantic aspects in discourse for aphasic and normal control responses

<b>Pragmatic Aspects</b>	<b>Aphasic vs. Controls</b>
1. Appropriateness of response form	Same
2. Type of speech act: Admonition, advice Maxim	Same Different
3. Perspective taken in interpreting lesson	Same
<b>Semantic Aspects</b>	<b>Aphasic vs. Controls</b>
1. Content of response: Textual information vs. Extratextual information	Different
2. Semantic relationship expressed between component speech acts (causal, conditional, temporal)	Same
3. Syntactic devices used to signal semantic relationships (e.g., if, when)	Same
4. Lexicosyntactic complexity of responses	Different

reflected in a wider variety of response types, i.e., a brief summary, the outcome of the story, a lesson, and even a theme, for both groups. Perhaps more interesting is the evidence of a similar pragmatic function in regard to the distribution of speech acts between aphasic and normal control groups. Both groups used the speech act of admonition the most, followed by the speech act of advice, with maxim being used the least. Moreover, both groups exhibited a similar ratio in response interpretations according to whether a lesson was produced from the perspective of the „winner” or „loser” in the fable. The data show that the fable was interpreted from the loser’s perspective 56% of the time for normal subjects and 50% of the time for aphasic patients, illustrating the similarity in perspective of interpretation.

Somewhat surprisingly, the aphasic patients showed preservation in the semantic aspects of their responses which was not necessarily expected due to the language deficits inherent in aphasia. Specifically, both groups produced similar semantic relationships between the speech act components in formulating their lesson. The most commonly expressed semantic relation was that of causal, followed by conditional, then temporal relation. Examples of aphasic responses for each relation are: „Be satisfied with what you have because if you try to show off, you’re going to lose what you have.” (causal); „If you become high, be careful.” (conditional); „Be careful when people are trying to help you.” (temporal). Moreover, it is interesting to note that both groups used appropriate syntactic markers (such as: because, if, when and then) to signal the semantic relations mentioned above (i.e., causal, conditional, and temporal).

Clearly, the similarities for aphasic and normal individuals in the pragmatic and semantic aspects of gist and moral responses attest to the continuum of response types between the two populations. However, identifying the similarities is only part of the picture,

since clear differences between the groups were also evident. One of the most notable differences was discussed in the first section of this paper. That is, the semantic content of the two groups was significantly different for the moral task as manifested by aphasic patients' responses that closely adhered to the explicit text (intratextual). It is interesting to note that attempts at eliciting extratextual responses from aphasic patients with a probe question (e.g., Can you apply the lesson to life or to people?) were not consistently effective in eliciting a higher level response (i.e., generalized moral). In contrast, the normal subjects typically gave generalized morals of an extratextual nature, spontaneously. Therefore, probes seeking more generalized responses were not necessary with normal subjects.

An additional difference was found between subgroups according to speech acts. The speech act of maxim was rarely used by aphasic patients (3 occurrences) as compared to normal subjects' use of maxims (21 occurrences).

Another important difference between groups was observed in the lexicosyntactic form of the speech act. Whereas aphasic patients showed simplification in the lexical and syntactic systems, the normal controls' discourse reflected generalizations at the lexical level. The normal control subjects used a variety of linguistic devices to transform the information contained in the original stimulus at high levels of generalization. Sophistication in the use of the lexical system was apparent in the normal subjects' choice of abstract lexical items that were often derivationally complex. This lexical sophistication was seen in normals on both the gist (e.g., „The fox's trickery got the cheese from the raven" – Fox and Raven fable) and the moral (e.g., „Legacies we receive are sometimes tied up with hard work to win them" – Farmer and Sons fable) tasks. The normal subjects also produced more idiomatic expressions (e.g., „Fox used his brain to get out"; „Fox outfoxed the goat" – Fox and the Goat fable) and nonliteral use of language often in the form of a proverb (e.g., „Birds of a feather flock together" – Raven and Pigeons fable; „Don't toot your horn too soon and too long"; „The loudest profession of a victory is not always the one that gets the plum" – Two Roosters fable).

Greater linguistic facility in normal controls as compared to aphasic patients was also evident in the use of linguistic structures. Normal controls showed increased embedding of clauses resulting in high propositional density as exemplified in the following gist responses: „The raven that tried to be what he was not didn't fit in with either the previous group or the one that he tried to be like" (Raven and Pigeons fable); „The rooster who bragged about a victory got in trouble and the rooster who was humiliated in hiding became the winner" – (Two Roosters fable); „Don't be too taken with your own importance; let your ego run away with you, and you're liable to lose out on something" (Two Roosters fable). Finally, the normal controls also showed facility with the language system in the use of prepositions to signal embedding (e.g., „The raven through trickery was trying to reach a goal but it didn't work" – [Ravens and Pigeons]; „The fox was clever in a way of prying the cheese away from the raven" – [Fox and Raven]).

In contrast to the normal group, the aphasic patients exhibited conceptual simplification manifested in the use of concrete lexical items and nongeneralized responses containing predominantly the explicit textual information. Aphasic responses exemplifying this pattern include the following: „Never portray a raven to pigeons" (Raven and Pigeons). „You can't trust doctors", „Look out for doctors" (Woman and Doctor). In regard to syntactic embedding of information, aphasic patients produced very basic, simplified components of information, e.g., „If you have become high, be careful" (Two Roosters); „Don't

open your mouth when you have cheese (Fox and Raven); „Be satisfied with what you have” (Raven and Pigeons); „If you fall into a well, you’ll get out (Fox and Goat). Also, apparent in the above responses is the use of nonspecific vocabulary. However, as noted under similarities, the aphasic patient showed preservations in 1) speech acts of advice and admonition, 2) the semantic content of the components, and 3) the syntactic marking of the relation (e.g., If, when). These findings indicate that aphasic patients are capable of producing well-formed responses at a number of linguistic levels. Nonetheless, their responses are simplified in form and content.

## Discussion

The most important finding from the group analyses was the difference between the aphasic patients and normal control subjects in response bias for the moral task. Specifically, the aphasic patients produced significantly more morals that adhered closely to the explicit text, i.e., the responses were intratextual. As stated previously, the inherent requirement in deriving a moral is that it be applicable to a broader context than the specific story content. That is, an appropriate moral must be a generalized lesson that incorporates the textual information (new information) and applies it to a broader context based on world knowledge (old information) through inferential processes. In regard to macrostructure, the pattern of responses seen in the aphasic patients indicated a reduction in the level of generalization for the moral task. It is interesting that no difference in the level of generalization for the macrostructure task of gist was evident. However, this is not an unexpected finding since an applicable gist can be derived using only the explicit story content. While inferential processing within the textual content is involved in focusing on the most important information for a gist response, inferencing between the textual information and world knowledge is not necessarily a requirement in producing an appropriate gist response. Thus the acceptable level of generalization is lower for the gist task as compared to the moral task.

The evidence of a greater gap in performance between the aphasic and normal control subjects on the moral task as compared to the gist task has important clinical implications. This finding suggests that macrostructure tasks that require higher levels of generalization may be more revealing in terms of how effectively aphasic patients can integrate two sources of information (i.e., textual and world knowledge) for communicative purposes. Since discourse comprehension and production requires that the listener build inferences between the explicit textual information and knowledge of the world, it is important to select and develop tasks to tap patients’ ability to build inferences between these two knowledge sources.

In regard to pragmatic and semantic aspects in processing discourse macrostructure in aphasia, the findings on the gist and moral tasks revealed that the aphasic patients were capable of manipulating information contained in the fables at different levels of specificity. This is an important finding since these two tasks involved processing information above and beyond what is required in a mere retelling of the story content or even in selecting components of the story content in response to specific probes for information. Indeed, the analyses of the aphasic patients’ data showed that moderately impaired aphasic patients were capable of producing responses which were well-formed at multiple levels of representation, i.e., pragmatic, semantic, and syntactic.

Despite the similarities of response tendencies in normal and aphasic individuals, the aphasic patients manifested simplification at each level (i.e., pragmatic, semantic, syntactic) providing clear evidence of the aphasic patients' language impairment. Moreover, the failure to produce generalized moral responses suggested that the aphasic patients had difficulties going beyond a certain level of generalization as their responses relied heavily on the explicit textual content of the fable. That is, the moral responses of aphasic patients represented a literal interpretation of the fable content. In most instances, probes directed at eliciting generalizations failed in obtaining higher levels of responses. One possible explanation for the difficulty in producing generalized morals is the well-documented difficulty that aphasic patients have with processing nonliteral language.

However, it is not clear what is responsible for the tendency toward literal responses observed in aphasic patients. The question raised is what can explain the mechanism underlying the obvious difference between an aphasic patient's moral in the form of an admonition, „If you're a raven, don't open your mouth if you have cheese" and a normal control's moral in the form of a maxim, „Sometimes it's best to keep your mouth shut" for the Raven and Fox fable. The issue that warrants investigation is whether a literal response tendency in aphasia is a manifestation of a strategy to deal with the deficit or whether it is the deficit itself. We believe that carefully designed diagnostic procedures should be developed to determine whether the communicative difficulties of aphasic patients in producing generalized responses reflect deficits in making inferences from textual to world knowledge. This information will provide a valuable direction for improved therapeutic protocols.

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## Appendix

Narrative stimuli used consisted of six verbal fables and two pictured stories.

### **Fox and Raven**

A raven was sitting on a tree holding a piece of cheese in his beak. A fox saw him and decided he wanted the cheese. He stood under the tree and began to praise the raven. He told the raven that he was a very beautiful bird and that he should become a king. The fox said that he would like to hear the raven's voice to be sure that the raven could give orders. Then the raven decided to show off his voice. He opened his beak and the cheese fell on the ground. The fox grabbed the cheese and ran away.

### **Woman and Doctor**

A certain old woman suffered from a disease of the eyes. She called a doctor. The doctor came every day and rubbed some ointment on her eyes. When the old woman had her eyes closed, the doctor secretly carried her belongings out of her house. When he finished his treatment, he demanded payment. The old woman refused. The doctor took her to court. In court, the old woman said her vision was worse because before the treatment, she saw all of her belongings. But after the treatment, she could not see any of them. That is why she refused to pay.

### **Raven and Pigeons**

A hungry raven saw that pigeons in the pigeon coop had a lot of food. He painted his feathers white to look like them. But when he started to crow, they realized he was a raven and chased him away. So he returned to his own kind. But the other ravens did not recognize him because he had his feathers painted white, so they also chased him away.

### **Two Roosters**

Two roosters were fighting over the chicken yard. The one who was defeated hid in the corner. The other rooster flew to the top of the roost and began crowing and flapping his wings to boast of his victory. Suddenly, an eagle swooped down, grabbed the rooster and carried him away. This was good luck for the defeated rooster. Now he could rule the roost and have all the hens that he desired.

### **Fox and Goat**

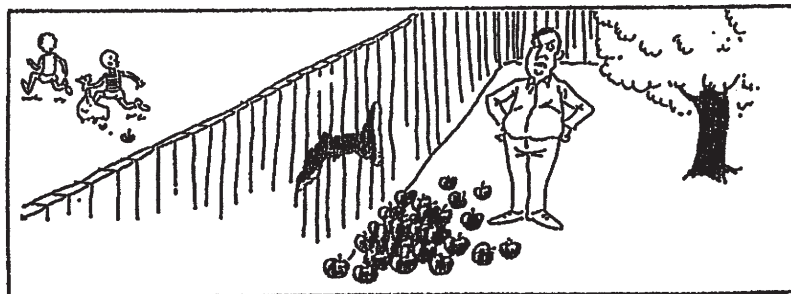
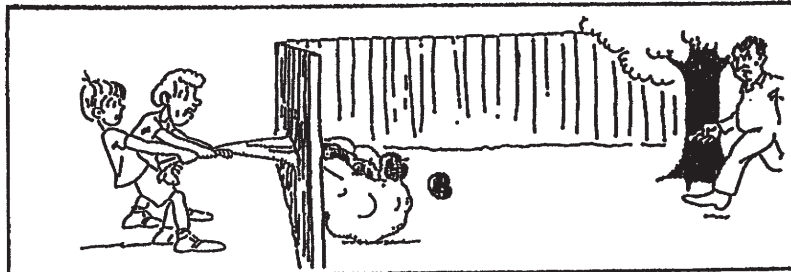
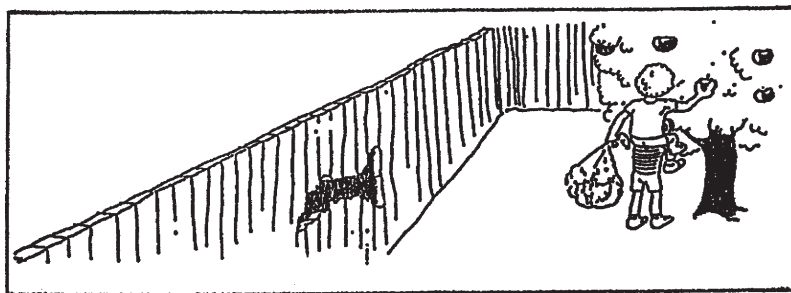
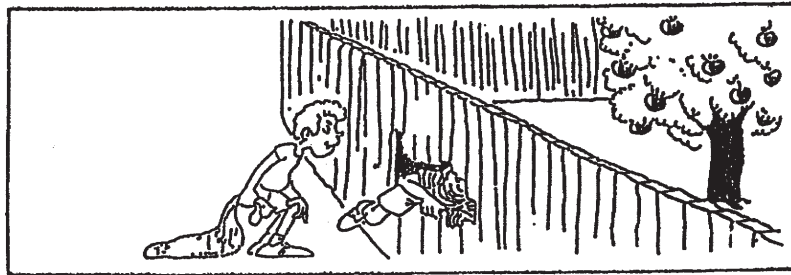
Once upon a time, a fox was chasing a rooster. He did not notice a well in the ground, and so he fell into it. The well was very deep, and the fox could not get out. He looked up and noticed a goat standing at the edge of the well. The fox then lowered his head and pretended that he was drinking water. He began saying how good the water tasted, making the goat want some of it. The goat jumped in and began drinking. This is what the fox was waiting for. The fox climbed onto the goat's back, jumped out and ran away. Later that night the goat was rescued by the farmer.

### **Farmer and Sons**

A farmer worked in a vineyard and became rich. He wanted his sons to be just like him. On his deathbed, the farmer told his sons that there was a great treasure buried in the vineyard. After the farmer died, the sons went to the vineyard and dug up the soil. They could not find a buried treasure. At harvest time, the vineyard produced the best grapes ever. Now, the sons understood the meaning of the treasure.



The Apple Theft



Fox and Dog

