A Study of Sentence Comprehension of Aphasic Subjects

Robert S. Pierce
St. Luke's Methodist Hospital, Cedar Rapids, Iowa

The advancement of knowledge concerning strategies used by normal subjects to decode sentences renders it necessary to reconsider how aphasic subjects attempt to decode sentences. Bever (1970) has suggested that normal listeners use a canonical-sentoid strategy to facilitate the task of assigning semantic relationships to the key lexical items in the surface structure of a sentence. Bever states that when a listener hears a noun-verb-noun sequence in a sentence, he or she imposes onto those lexical items the relationship of subject-verb-object. Accordingly, when a surface level noun-verb-noun sequence does not accurately reflect a deep level subject-verb-object relationship (as in a passive sentence), the decoding process should become more complex.

A number of studies have demonstrated that the accuracy with which normal listeners can decode certain sentences is affected by the presence or absence of specific markers or cues in the surface structure of the sentence (Fodor and Garrett, 1967; Fodor, Garrett, and Bever, 1968; and Hakes, 1972). For example, Hakes (1972) demonstrated that sentences containing "that-" complement constructions (e.g., "John believed that the boy was a fool.") were significantly easier for normal listeners to comprehend when the "that" marker was present than when it was absent. These markers appear to facilitate comprehension by allowing the listener to assign a grammatical role to a word or group of words (e.g., noun, verb, main clause, subordinate clause) earlier than he or she might otherwise be able to.

A relatively small number of studies have suggested that the strategies described previously may be applicable to the sentence comprehension processes of aphasic subjects. Guilford and Gallagher (1977) reported a study which suggested that aphasic subjects utilize a strategy similar to Bever's canonical-sentoid strategy when they respond to certain wh- questions. Zurif and Caramazza (1976) reported that aphasic subjects made significantly more errors responding to sentences that required subject-object word order distinctions than to sentences that required distinctions based on (1) the complement, (2) the verb, or (3) a combination of the verb and the complement.

Zurif and Caramazza (1976) also provided evidence from a meta-linguistic study that aphasic subjects with anterior lesions and relatively intact auditory comprehension skills were sensitive to the role of prepositions in sentences, although they were not sensitive to the role of pronouns or articles. On the contrary, their anterior aphasic subjects with relatively poor auditory comprehension were not sensitive to the role of pronouns, articles, or prepositions. The authors suggested that the subjects with relatively intact comprehension were more sensitive to the preposition because it serves to mark the semantic relationship between noun phrases. For example, the preposition is the only surface structure cue which indicates the underlying grammatical role of "John" in the sentence "Gifts were given to "by" John.". Articles and pronouns do not carry this same semantic value. Kurowski (1976) expanded the Zurif and Caramazza results by demonstrating that only those aphasic subjects who were sensitive to prepositions on the meta-linguistic task were able to accurately comprehend prepositions on a sentence comprehension task.

The purpose of the present investigation was to further explore the nature of sentence comprehension of aphasic subjects. Emphasis was placed on the comprehension of negation, word order, and tense because these types of sentence constructions have been shown to present differential degrees of difficulty for comprehension by aphasic subjects (Parisi and Pizzamiglio, 1970 and Lesser, 1974).

Procedures

Materials

To assess the sentence comprehension skills of aphasic listeners, a Sentence Comprehension Test (SCT) was developed. The SCT consisted of 16 stimulus sentences for each of the following six sentence types: (1) Negation, (2) Preposition of Destination, (3) Reversible Passive, (4) Irregular Past Tense, (5) Future Tense, and (6) Regular Past Tense. Irregular Past Tense and Regular Past Tense were assessed separately as pilot data indicated that aphasic subjects perform differently on sentences containing those two verb forms.

There was a set of three vertically arranged photographs for each of the stimulus sentences. One of those pictures correctly depicted the content of the sentence. For Negation, both false foils showed a person doing something which the stimulus sentence indicated that he or she was not doing. For Preposition of Destination, one false foil depicted a reversal of the direct/indirect object relationship from that represented by the correct picture. The second false foil depicted the same people, animals, and/or objects, but they were engaged in somewhat different activities. For Reversible Passive, one false foil depicted an action that represented a reversal of the subject/object relationship from that represented by the correct picture. The second false foil showed the same people and objects but, again, they were engaged in somewhat different activities. The false foils for Irregular Past Tense, Regular Past Tense, and Future Tense depicted the same activity as shown in the correct picture, but in the two remaining tenses. The stimulus sentences used for each sentence type are listed in Appendix A.

A sentence from each sentence type occurred once within six successive sentences. The sentence types were randomly ordered within each of those six successive sentences. The 96 sentences were tape recorded and played to each subject in the same order. The subject was required to point to the appropriate picture.

A considerable amount of pilot work was done during the development of the SCT to (1) minimize the possibility that errors would be made on the SCT as a result of such factors as visual confusion between the picture foils, and (2) maximize the possibility that the scores on the SCT would demonstrate acceptable degrees of reliability.

Subjects

Forty-seven aphasic subjects participated in this study. Table 1 summarizes the characteristics of those subjects. In addition, each subject passed a single noun identification screening test which insured that he or she could (1) comprehend instructions of the type associated with the SCT, (2) correctly recognize pictures of objects, and (3) point to the correct picture from a display of three pictures in response to a single word. It

was assumed that the requirement of passing this screening test would also have eliminated persons from the subject group who may have had a significant hearing impairment.

Table 1. Summary of the characteristics of the 47 aphasic subjects who participated in this study.

Category	Characteristic	Number of Subjects
Sex	male	35
	female	12
Education	less than 12 years	15
	12 years	14
	more than 12 years	15
	unknown	3
Age	mean	56 years, 3 months
	range	31 years, 7 months to 78 years, 5 months
Time Post Onset	mean	approximately 3 years, 0 months
	range	1 month to 11 years, 11 months
Etiology	cerebral vascular accident	39
	trauma	6
	surgical	1
	cerebral disease	1

Subgroups of Subjects. Prior to the administration of the SCT, each subject was (1) engaged in conversation which included the subject describing the cookie theft card from the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1972), and (2) administered the Complex Materials subtest from the BDAE. Based on that conversation, each subject was assigned (1) a severity of aphasia impairment rating from the severity rating scale of the BDAE, and (2) a classification of having "fluent" or "nonfluent" speech on the basis of their phrase length, rate of speech, and prosody. In order to increase the probability that the subjects were classified validly on the basis of speech fluency, an *a priori* decision had been made to exclude from subgroups those subjects who had a severity rating of 4.0 or more (Goodglass, Quadfasel, and Timberlake, 1964). That decision resulted in eight of the original 47 subjects being omitted from assignment to a subgroup.

Subjects who achieved scores of seven or more on the Complex Materials subtest were judged to have high auditory comprehension skills. Subjects who achieved scores of six or less were judged to have low auditory comprehension skills.

The 39 subjects were subsequently classified into one of four subgroups based on their (1) fluency rating, and (2) performance on the Complex Materials

subtest. These four subgroups were characterized by: (1) nonfluent speech and high auditory comprehension skills (NF-HAC, N=19), (2) nonfluent speech and low auditory comprehension skills (NF-LAC, N=7), (3) fluent speech and high auditory comprehension skills (F-HAC, N=7), and (4) fluent speech and low auditory comprehension skills (F-LAC, N=6).

Results

Pearson product moment correlations revealed that the 47 subjects' total scores on the SCT were not significantly related to their (1) age (r=-.20), (2) duration post-onset (r=.25), or (3) education (r=.15) (r.05= .2888, df=45). Table 2 contains indices of reliability of the scores for each sentence type. Those indices indicate that the reliability of the scores for each sentence type are moderate to high. The internal consistency coefficient for the SCT, as a whole, was .92.

Table 2. Indices of reliability for each sentence type of the Sentence Comprehension Test.

Sentence Type	Split-Half[1]	Internal Consistency[2]	Standard Error of Measurement[3]
Negation	.73	.71	1.23
Preposition of Destination	.78	.75	1.63
Reversible Passive	.75	.68	1.62
Irregular Past Tense	.82	.73	1.41
Future Tense	.92	.87	1.40
Regular Past Tense	.76	.73	1.81

[1]The split-half correlation coefficients were estimates of the reliability of each sentence type using the Spearman-Brown formula.

[2]The internal consistency coefficients were determined using the Kuder-Richardson formula 20.

[3]The standard errors of measurement were determined by using the formula $Se = Sx / \overline{1 - r_{xx}}$, and those values represent the standard deviation of scores the subject would obtain on a large number of test replications using randomly parallel test forms (Ferguson, 1972).

The scores on the Complex Materials subtest correlated with the scores on the SCT and on each sentence type as follows: SCT, .51; Negation, .36; Preposition of Destination, .61; Reversible Passive, .52; Irregular Past Tense, .25; Regular Past Tense, .26; and Future Tense, .40. All of the correlations except for those with Irregular Past Tense and Regular Past Tense were significant from zero (r .05 =.288, df=45). These correlations suggest (1) that the Complex Materials subtest and the SCT, to some degree, were assessing different aspects of the auditory comprehension process, and

(2) the subjects' performance on the Complex Materials subtest was most strongly related to their performance on those sentence types requiring word order distinctions.

Performance on the SCT by Aphasia Subgroups. Table 3 contains the means and the standard deviations of the scores for each sentence type for the four subgroups. Figure 1 displays a graph of those mean scores. A two factor analysis of variance (sentence type by aphasia subgroup) with repeated measures on one factor (sentence type) (Winer, 1971) revealed that the interaction between sentence type scores and aphasia subgroups was significant ($F=2.13$, $F.05=1.75$, $df=15,175$).

Table 3. Mean scores for each sentence type on the Sentence Comprehension Test for the four following subgroups: nonfluent, high auditory comprehension (NF-HAC, N=19); nonfluent, low auditory comprehension (NF-LAC, N=7); fluent, high auditory comprehension (F-HAC, N=7); and fluent, low auditory comprehension (F-LAC, N=6). The standard deviations of the scores are contained in the parentheses.

	Aphasia Subgroup			
Sentence Type	NF-HAC	NF-LAC	F-HAC	F-LAC
Negation	14.84 (1.38)	13.00 (2.00)	12.43 (4.20)	12.50 (2.17)
Preposition of Destination	12.53 (2.70)	7.86 (3.18)	10.71 (2.93)	8.67 (3.50)
Reversible Passive	11.32 (2.91)	8.86 (2.61)	9.86 (2.12)	7.00 (2.83)
Irregular Past Tense	8.79 (2.70)	8.57 (3.15)	10.43 (3.51)	10.00 (2.83)
Future Tense	8.68 (4.46)	6.14 (3.44)	7.43 (6.16)	5.83 (4.92)
Regular Past Tense	6.79 (2.64)	7.71 (3.35)	8.43 (3.74)	6.50 (3.39)

However, more careful observation of Figure 1 suggests that the pattern of performance across sentence types was similar for aphasia subgroups NF-LAC, F-HAC, and F-LAC. Interchanging the mean scores for the NF-LAC and F-LAC subgroups on the Reversible Passive sentence type would produce almost identical patterns for all three subgroups. Resubmitting the data for these three subgroups to a two-factor analysis of variance with repeated measures on one factor supported this observation ($F=0.69$, $F.025=2.41$, $df=10,85$). These three subgroups, therefore, may be considered to have performed as one group with respect to their pattern of scores across sentence types, although the magnitude of their scores may have differed significantly. This group is hereafter referred to as the Combined subgroup (COMB).

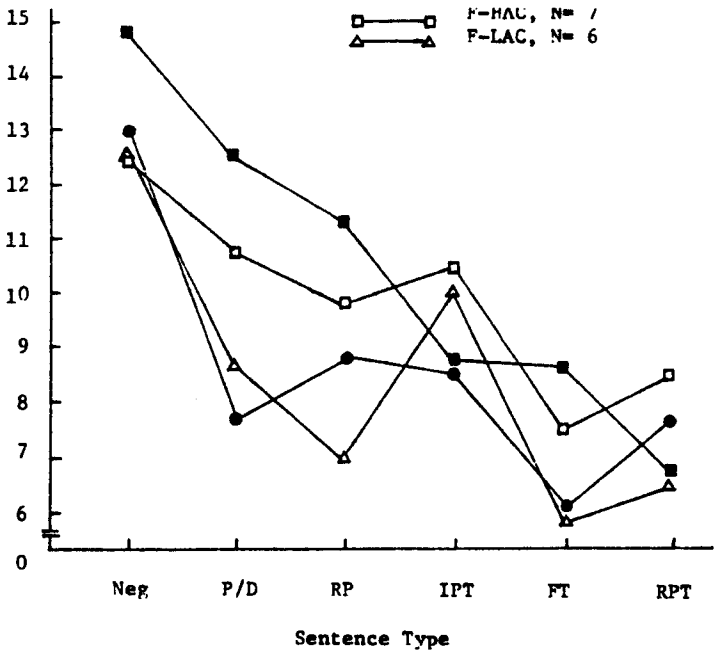

Figure 1. Mean scores for sentence types on the Sentence Comprehension Test for the four following subgroups of aphasic subjects: nonfluent, high auditory comprehension (NF-HAC); nonfluent, low auditory comprehension (NF-LAC); fluent, high auditory comprehension (F-HAC); and fluent, low auditory comprehension (F-LAC). The six sentence types are Negation (Neg), Preposition of Destination (P/D), Reversible Passive (RP), Irregular Past Tense (IPT), Future Tense (FT), and Regular Past Tense (RPT).

The mean scores and the standard deviations of the scores on the six sentence types for subgroup COMB are contained in Table 4. Figure 2 displays a graph of those mean scores. The pattern of scores across sentence types for the COMB subgroup remained significantly different than for the NF-HAC subgroup (F=4.83, F.025=2.67, df=5,175).

Table 4. Means and standard deviations for each sentence type for the 20 aphasic subjects in the Combined subgroup (COMB).

Sentence Type	Mean	Standard Deviation
Negation	12.65	2.85
Preposition of Destination	9.10	3.28
Reversible Passive	8.65	2.66
Irregular Past Tense	9.65	3.13
Future Tense	6.50	4.75
Regular Past Tense	7.60	3.41

Analysis of the simple effect of sentence type for subgroup NF-HAC revealed significant differences between those means (F=26.22, F.05=2.29, df= 5,175). A Newman-Keuls test, used to assess the significance of the differences between each possible pair of sentence type means, in conjunction with Figure 1, revealed that the NF-HAC subjects achieved significantly higher scores on Negation than they achieved on the five other sentence types.

Furthermore, they achieved significantly higher scores on Negation, Preposition of Destination, and Reversible Passive than they achieved on Irregular Past Tense, Regular Past Tense, and Future Tense. Finally, the NF-HAC subjects achieved significantly lower scores on Regular Past Tense than they achieved on the five other sentence types.

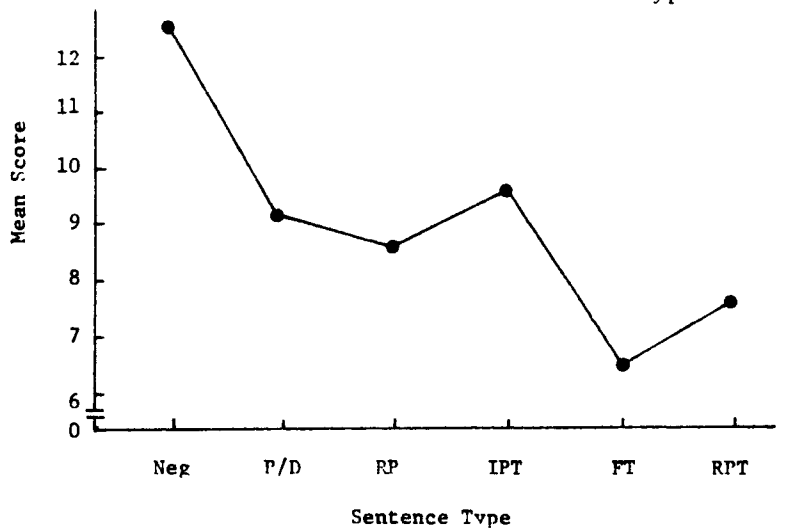

Figure 2. Mean scores for sentence types on the Sentence Comprehension Test for the 20 aphasic subjects in the Combined subgroup (COMB). The six sentence types are Negation (Neg), Preposition of Destination (P/D), Reversible Passive (RP), Irregular Past Tense (IPT), Future Tense (FT), and Regular Past Tense (RPT).

A test of the main effect of sentence type for the subjects in the COMB subgroup revealed significant differences between those means ($F=13.69$, $F.05=2.79$, $df=5,85$). A Newman-Keuls post-hoc analysis of the significance of the differences between each possible pair of sentence type means, in conjunction with Figure 2, indicated that the COMB subjects' scores on Negation were significantly higher than on the five other sentence types, and that group's scores on Future Tense were significantly lower than on all of the other sentence types except Regular Past Tense.

Analysis of the simple effect of aphasia subgroup for each sentence type revealed F values of 1.56 for Negation, 3.97 for Preposition of Destination, 3.10 for Reversible Passive, 0.66 for Irregular Past Tense, 0.60 for Regular Past Tense, and 1.81 for Future Tense. Only those F values associated with Preposition of Destination and Reversible Passive were significant ($F.05=2.76$, $df=3,104$). These results indicate that only on those two sentence types did one or more of the aphasia subgroups perform significantly better than did the other subgroups.

A Newman-Keuls post hoc analysis for Preposition of Destination, in conjunction with Figure 1, indicated that the NF-HAC subgroup achieved significantly higher scores on that sentence type than did the F-LAC and the NF-LAC subgroups. A Newman-Keuls post hoc analysis for Reversible Passive, again in conjunction with Figure 1, revealed that the NF-HAC subgroup achieved significantly higher scores on Reversible Passive than did the F-LAC subgroup.

Analysis of Error Responses. Table 5 contains the results of the analysis of error responses for the NF-HAC and the COMB subgroups for all of the sentence types except Negation. For Irregular Past Tense, Regular Past Tense, and Future Tense, the foil representing the present tense was

designated as foil 1 and the remaining foil representing either past or future tense was designated as foil 2. For Reversible Passive, the foil representing a reversal of the subject/object relationship was designated as foil 1 and the remaining foil as foil 2. For Preposition of Destination, the foil representing a reversal of the direct/indirect object relationship was designated as foil 1 and the remaining foil was designated as foil 2.

As Table 5 indicates, the observed distribution of responses on each incorrect foil differed significantly from the expected (i.e., equal) distribution for each of the five sentence types for the NF-HAC subgroup and for each of the sentence types except Preposition of Destination for the COMB subgroup. Furthermore, these differences were extremely large for Irregular Past Tense, Regular Past Tense, Future Tense, and Reversible Passive. In contrast, the difference between the observed and the expected distributions for Preposition of Destination only barely reached significance for the NF-HAC subgroup and failed to reach significance for the COMB subgroup. Table 5 further indicates that, for Irregular Past Tense, Regular Past Tense, and Future Tense, the NF-HAC and the COMB subjects predominantly selected the foil representing the present tense. For Reversible Passive, those subjects predominantly selected the foil representing a reversal of the subject/object relationship. For Preposition of Destination, the NF-HAC subjects selected the foil representing the reversal of the direct/indirect object relationship with significantly greater frequency than they selected the other foil, while the COMB subjects selected each foil with relatively equal frequency.

The only manner in which the two false foils for Negation could be differentiated was on the basis of the order in the display of the pictures. The resulting Chi Square values were 0.00 for the NF-HAC subgroup and 0.37 for the COMB subgroup ($X^2.05=3.84$, df=1). These nonsignificant values indicated that the position of a foil in the array of photographs did not significantly influence the subjects' responses. Rather, the subjects appear to have responded to the false foils randomly.

Discussion

Factors of sentence length or transformational complexity cannot account for the present results. However, the results of the error analysis do suggest that all of the aphasic subjects relied heavily on a sentence decoding strategy that was similar to Bever's (1970) canonical-sentoid strategy. Specifically, the subjects appeared to interpret the sentences as if they were worded in a subject-verb-object present tense form. When this interpretation was not accurate (i.e., on Reversible Passive, Irregular Past Tense, Regular Past Tense, and Future Tense), the subjects demonstrated an extremely strong tendency to choose the foil that did represent a subject-verb-object present tense form. On the contrary, when that interpretation was consistent with the form of the sentence (i.e., on Negation and Preposition of Destination), the response errors were more equally distributed between the false foils. In this case, interpreting the sentences as being in a subject-verb-object present tense form would not cause the subjects to select one particular incorrect foil to the exclusion of the other foil.

These results suggest that aphasic listeners may approach sentence decoding in much the same way as normal listeners do. However, whereas

normal listeners are facile at recognizing deviations from the anticipated form of the sentence, aphasic listeners are not. Any change in the subject-verb-object present tense form of the sentence may go unnoticed by the aphasic listener, thus resulting in comprehension errors. If this is the case, then the aphasic person's success at sentence decoding may depend, to a large extent, on his or her ability to recognize deviations from the anticipated form.

The two sentence types requiring subjects to make word order distinctions (Preposition of Destination and Reversible Passive) were easier for the subjects with relatively intact auditory comprehension to comprehend than they were for those subjects with relatively poor auditory comprehension. This difference reached significance with respect to the NF-HAC subgroup and approached significance with respect to the F-HAC subgroup. (This latter result may have been the result of sampling error due to the small sample sizes involved.) One possible explanation for the superior performance of the two HAC subgroups is that they were able to cue into the prepositions "to" in Preposition of Destination and "by" in Reversible Passive as markers of the semantic relationships contained in the deep structures of those sentences. The subjects with poor auditory comprehension were not able to effectively utilize these prepositions as markers. This interpretation is consistent with the results reported by Zurif and Caramazza (1976) and Kurowski (1976), and suggests that one aspect of relatively intact auditory comprehension skills in aphasic subjects is the ability to utilize surface structure markers that signal word order relationships.

Contrary to the subjects' performance on Preposition of Destination and Reversible Passive, all of the subjects performed poorly on the three tense related sentence types, regardless of the level of the subjects' auditory comprehension skills. As the error analysis indicated, all of the subjects appeared to interpret those sentences as being in a present tense form. Apparently, none of the subjects were able to effectively utilize any of the surface structure markers to help them realize that the tense of the sentences was not the present tense. This interpretation is supported by the performance of one aphasic patient, who had relatively good auditory comprehension but was not included in the study. When presented with the stimulus sentence "The woman will tear the paper.", she could be heard rehearsing the sentence to herself as she searched for the correct foil. However, she was saying "The woman is tearing the paper.". Following completion of that item, the investigator pointed to the foil representing the future tense and asked the patient what was happening. She replied, "She is going to tear the paper.". Clearly, this patient recognized the future aspect of the correct foil but she failed to realize that the stimulus sentence was not in the present tense.

All of the subjects achieved high scores on Negation. They may have performed well on this sentence type because (1) Negation maintained the integrity of the subject-verb-object present tense form, and (2) "not" may have served as a potent marker of the negation concept. However, it is also possible that the scores on Negation were inflated because of the nature of the foils. Because two foils depicted a person doing a specific activity and one foil depicted the negation of that activity, the subjects could have selected the "odd picture" without regard to the linguistic content.

Summary

The results of this investigation indicate that (1) aphasic subjects rely heavily on the assumption that a sentence is in a subject-verb-object present tense form, (2) aphasic subjects with relatively good auditory comprehension are able to utilize surface structure markers that signal word order distinctions while aphasic subjects with poor auditory comprehension are not, and (3) aphasic subjects are not able to effectively utilize surface structure markers that signal changes in tense, regardless of the level of their auditory comprehension skills. These results suggest that the surface structure form of a sentence may be highly influential to the success of sentence decoding by aphasic listeners. Clearly, the role of surface structure markers as facilitators of the sentence decoding process requires further research.

Appendix

Stimulus Sentences for the Sentence Comprehension Test by Sentence Types

Stimulus sentences for the Negation sentence type:

1. The man is not holding a ball.
2. The woman is not reading a book.
3. The man is not touching the woman.
4. The man is not carrying a box.
5. The woman is not typing a letter.
6. The man is not lifting a box.
7. The boy is not sitting on a chair.
8. The girl is not eating some fruit.
9. The man is not throwing a ball.
10. The woman is not wearing a hat.
11. The girl is not swinging a rope.
12. The man is not playing a musical instrument.
13. The woman is not looking at a picture.
14. The man is not buttoning a coat.
15. The girl is not carrying a coat.
16. The man is not taking a picture.

Stimulus sentences for the Preposition of Destination sentence type:

1. The man takes the boy to the bike.
2. The girl takes the box to the boy.
3. The woman takes the nightcase to the bathrobe.
4. The woman takes the tennis racket to the balls.
5. The man takes the girl to the boy.
6. The woman takes the baby carriage to the girl.
7. The man takes the food to the dog.
8. The man takes the leash to the dog.
9. The woman takes the bottle to the glass.
10. The man takes the boy to the coat.
11. The man takes the girl to the wagon.
12. The man takes the dog to the wagon.
13. The boy takes the hat to the girl.
14. The woman takes the man to the trumpet.
15. The man takes the boy to the gun.
16. The man takes the chair to the girl.

Stimulus sentences for the Reversible Passive sentence type:

1. The man is followed by the woman.
2. The wagon is followed by the dog.
3. The girl is hit by the boy.
4. The woman is kicked by the man.
5. The boy is pushed by the girl.
6. The boy is pulled by the girl.
7. The bicycle is followed by the wagon.
8. The man is lifted by the woman.
9. The man is hit by the ball.
10. The dog is chased by the man.
11. The wagon is pulled by the bicycle.
12. The woman is followed by the children.
13. The book is covered by the paper.
14. The woman is grabbed by the man.
15. The man is punched by the woman.
16. The baby carriage is pushed by the bicycle.

Stimulus sentences for the Irregular Past Tense sentence type:

1. The woman took off her hat.
2. The boy caught the ball.
3. The woman hung the picture.
4. The girl drew a picture.
5. The woman put on a coat.
6. The boy blew out the candle.
7. The woman wrote a letter.
8. The woman took the book.
9. The boy shot the girl.
10. The girl fell off the chair.
11. The man threw the ball.
12. The girl broke the doll.
13. The girl made a block tower.
14. The woman cut the paper.
15. The dog ate his dinner.
16. The woman drank the beer.

Stimulus sentences for the Future Tense sentence type:

1. The man will sweep the floor.
2. The man will blow up the balloon.
3. The man will open the book.
4. The girl will drink some water.
5. The woman will tear the paper.
6. The woman will drop the doll.
7. The woman will sit in the chair.
8. The man will carry the box.
9. The woman will eat the apple.
10. The man will pour the water.
11. The boy will kick the ball.
12. The man will deal the cards.
13. The man will put on his shoe.
14. The man will bite the sandwich.
15. The man will stand on the chair.
16. The boy will ride the bicycle

Stimulus sentences for the Regular Past Tense sentence type:

1. The woman opened the can.
2. The man untied the shoelace.
3. The man combed his hair.
4. The woman typed the letter.
5. The woman spanked the girl.
6. The man sawed the wood.
7. The boy jumped over the wagon.
8. The man closed the briefcase.
9. The woman cleaned the table.
10. The woman cleared the table.
11. The man drilled a hole.
12. The woman picked up the box.
13. The woman poured the milk.
14. The woman covered the table.
15. The man rolled up the carpet.
16. The man buttoned his shirt.

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Discussion

Q: Did you know that all of the subjects had the vocabulary to understand all of the elements of the sentences?

A: Yes, I used a preliminary single-noun identification screening test which tested for comprehension of the objects used in the pictures. Furthermore, for each set of three pictures, the people and objects depicted were consistent across pictures.

Q: This is not so much a question but a comment in support of your findings. We completed a study not too long ago in which we gave subjects the opportunity to make errors involving lexical mismatches, like mismatches on the subject, verb, or object; or errors involving word order. What we found was that almost all of our aphasic patients were very adept at detecting lexical mismatches. Most of the errors that occurred involved confusions of word order. The other thing we found, and I'm wondering if you have any thoughts on this, was that unless the subjects made errors on lexical items within the sentences, there was almost no correlation between the subjects' performance on sentence verification and on the Token Test, about .04. Do you have any idea about the correlation between performance on your task and on the Complex Materials subtest?

A: The Pearson product moment correlation between total scores on the SCT and the Complex Materials subtest was .51. Based on the reliability coefficients of the two tests, the maximum correlation could be .91. So there was a rather large discrepancy. But when you analyze the two tests as far as factors such as memory are involved and even with respect to the type of sentences the tests required the subjects to comprehend, the two tests are quite different. The most extreme example is that the Complex Materials subtest does not require a subject to make any tense distinctions whereas half of the SCT does. Your results are similar to those reported by Zurif and Caramazza (1976).

Q: Do you have any data, or an idea in your mind, about the failure of subjects to respond to differences in tense when you are reading declarative descriptive sentences compared to tense in questions, where you'd be going tomorrow versus what happened yesterday. In other words is there an interaction between the type of utterance and tense?

A: The only thing I looked at other than what I presented was the influence of extra surface structure markers on the subject's ability to comprehend tense. What I found was that if you make the sentence read "The woman is going to tear the paper." rather than "The woman will tear the paper.", the aphasic subject's comprehension is significantly better. Also, if you make the past tense sentence read "The woman has torn the paper." rather than "The woman tore the paper.", the aphasic subject also shows significantly better comprehension.

Q: Goodglass recently published, in Brain and Language, a study in which he also verified this effect. He used comparative sentences like "The boy is taller than the girl." and broke them down into "the tall boy and the short girl" or something like that. He fragmented the sentence and found the same effect.

A: For a point of therapeutic interest, I would like to comment on something Dr. Rosenbeck said in his paper earlier today. We have worked with one subject, at our hospital, where by working on future tense sentences using the extra markers, that is improving the subject's comprehension of the future tense sentences by using extra markers and then systematically taking the markers away, we were able to show that his comprehension of those sentences without the extra markers did improve.