Does contextually Related Action Facilitate Auditory Comprehension? Performance Across Three Conditions by High and Low Comprehenders

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Although natural communication is rife with contextual redundancy, tests emphasizing minimal linguistic redundancy are thought to better reveal even the slightest disorders of auditory comprehension. These tests, such as the Token Test (DeRenzi and Vignolo, 1962), the Revised Token Test (McNeil and Prescott, 1978) and the Functional Auditory Comprehension Test (FACT) (LaPointe and Horner, 1978) are routinely used to describe auditory comprehension deficits across patient severity levels.

When data from these batteries are analyzed, consistent results obtain. The Token Test (1962) reliably detects the presence of overall comprehension impairment, but fails to disclose patterns of performance among subjects (Hageman, McNeil, Rucci-Zimmer, and Cariski, 1982). The FACT, with an added component of familiarity also detects overall impairment, but fails to produce group patterns of predictable performance (LaPointe, Holtzapple, and Graham, 1986).

In a study designed to compare effects of single-word comprehension with and without linguistic redundancy, Gardner, Albert, and Weintraub (1975 found that when a semantically supportive word was added to a sentence, subjects significantly improved their comprehension of target words. Recent speculation is that lack of contextual information may be more detrimental to groups of low level comprehenders than to high level comprehenders (Wertz, Rosenbek, and LaPointe, 1987). It seems logical that linguistic context, as a natural component of communication, will enhance performance. We questioned whether it might alter the quality of performance as well.

Questions. The purpose of this study was to explore performance of high and low comprehenders by introducing various conditions of context in one- and two-part commands. We elected to use the format of the FACT. This battery is structured with controlled syntax which is presumably graduated in difficulty by adding a parallel propositional segment to increase difficulty. Specifically, we attempted to discover the following:

1. Will patients respond differently to commands in conditions of appropriate (+) contextual relevance, neutral (=) contextual relevance, and inappropriate (-) contextual relevance?
2. Will there be any differences between groups of high level and low level comprehenders?
3. Will any word class patterns of response exist either in the group as a whole, in the subgroups of high and low level comprehenders, or in the various conditions of contextual relevance?

METHOD

We utilized two assessments. The first was a supplementary battery with which we would separate high from low performing comprehenders. For this, we used a shortened version of the Token Test and selected auditory comprehension tasks from the Western Aphasia Battery (WAB) (Kertesz, 1982).

To assess the effects of linguistic context, we created the Contextual Relevance Auditory Battery, or CRAB (see Appendix A). Ten objects were selected, each of which would be used for Action + Object pairings in one- and two-part commands. To assure parallel syntactic structure, each object had to have a function which could be described by a transitive verb. In other words, "spoon" was not a viable selection because, while it could be the object in an Action + Object sentence, no verb would be semantically predictive for the "spoon" given the syntactic restriction. To be predictive for spoon, a verb would require intransitive syntax ("stir with the spoon").

Three conditions were then devised:

A. Contextually relevant commands. (A+O),+semantic predictive.)
   Example: RING THE BELL.
B. Contextually neutral commands. (A+O), =semantic predictive.)
   Example: TOUCH THE BELL.
C. Contextually inappropriate commands. (A+O), -semantic predictive.)
   Example: ROLL THE BELL.

The same objects were used in all conditions. Condition A met the requirements described above. For Condition B, the ten objects were paired with neutral transitive verbs. Any one of the verbs in Condition B could be logically paired with any of the 10 objects. In Condition C, the 10 verbs from Condition A were paired with different objects to create possible, but not probable tasks.

Subjects were 10 aphasic males who ranged in age from 42 to 87 years ($\bar{X}$ = 66.7) and ranged in months post onset from .5 to 46 ($\bar{X}$ = 16.65). All subjects had a history of left hemisphere CVA and ranged in aphasia severity on the PICA (Porch, 1981) from the 29th to the 70th overall percentile ($\bar{X}$ = 51.9 OA percentile).

RESULTS

Subject data for all tests administered are included in Appendix B.

Appendix C presents performance data on the CRAB by all ten subjects. Data are presented for the high and low subgroups across conditions of relevance. Scores are reported for actions and objects in one- and two-part commands.

Table 1 shows performance for all conditions of relevance. Despite a strong trend for best performance in Condition A and worst performance in Condition C, differences failed to reach significance. All statistical analyses utilized one-way analysis of variance with Fisher's Least Significant Difference Test, using an alpha level of .05

Within each subgroup, the subjects scored significantly higher on related versus either inappropriate or neutral commands. No significant differences were found in either subgroup between the neutral and inappropriate conditions, despite the trend to perform least well in the inappropriate condition.

Table 2 reflects performance on action versus objects. Unexpected action-object relationship considerably exacerbated impairment in comprehension and led to a consistent gap between performance levels on objects versus actions. For the group and within high and low subgroups, performance was significantly better on objects than actions in the neutral and inappropriate conditions ($p < .05$). The trend to perform better on objects versus actions in the relevant condition did not reach significance for the group or for high and low subgroups.

Table 1. Subject performance per condition of relevance.

	(A) Related Context	(B) Neutral Context	(C) Inappropriate Context
Lows:			
$\bar{X}$	32.4	23.3	20.9
% correct	54%	39%	35%
Highs:			
$\bar{X}$	59	53	48
% correct	98%	88%	80%
Group:			
$\bar{X}$	45.7	38.2	34.5
% correct	76%	64%	57%
S.D.	22.1	18.5	15.2
Range	12-60	9-58.5	7-56

Table 2. Differences in action/object performance across conditions of relevance.

	(A) Related Condition		(B) Neutral Condition		(C) Inappropriate Condition	
	A	O	A	O	A	O
Lows:						
$\bar{X}$	11.3	21.1	4.6	18.7	4.0	16.9
% correct	38%	70%	15%	62%	13%	56%
Highs:						
$\bar{X}$	29	30	23	30	19.3	28.7
% correct	96%	100%	77%	100%	64%	96%
Group:						
$\bar{X}$	20.2	25.6	13.8	24.4	11.7	22.8
% correct	67%	85%	46%	81%	39%	76%

DISCUSSION AND CONCLUSIONS

We found no significant differences in performance across conditions of relevance when the group was analyzed as a whole. When the high and low subgroups were analyzed, however, there were significant differences between performance on inappropriate and related conditions and between the related and neutral conditions. These findings are consistent with the Gardner

et al. (1975) conclusions where neutral and inappropriate conditions were more difficult for both the high and low comprehension groups. The consistency of these results suggests that we may be greatly underestimating the abilities of our patients by eliminating naturally occurring linguistic redundancy from our test batteries.

Our findings regarding action versus object performance on the CRAB were not consistent with previous findings on the FACT. Subjects scored better on objects across conditions of relevance in both one- and two-part commands. Even when this level of performance did not reach significance, the trend held. One explanation for this may concern the syntactic structure of the stimuli.

As Lesser points out, syntax determines which class of lexical items may follow another. Because transitive verbs have predictive value for a noun to immediately follow, the sentence structure may create an alerting condition for the object. Often the expectation set up by verb meaning appeared to cause errors in object selection. For example, the command "blow the bottle" resulted in the subject pointing to the whistle. The apparent superiority of object performance in our study may be more a function of consistent syntax presentation than of word class.

Our subject response patterns suggest that the predictive value of syntax plus the predictive value in linguistic content are used to create an optimal condition for comprehension. This formula also relates to most of what each of us and our patients listen to each day. We do not presume that this equation is exhaustive for what are vital components to comprehension, however we do feel it has important clinical implications. If we pair objects with actions that are most expected both in terms of meaning and structure, we facilitate comprehension. Changing this equation by substituting either inappropriate or even neutral actions seems to impair performance.

As a final comment to this study, we would like to highlight the disparate testing results found in Appendix B. All of our subjects scored consistently poorest on the Token Test, a bit higher on the CRAB, and obtained their highest scores on the Western Aphasia Battery subtests. In the low group, this difference was dramatic, as evidenced by Subject 4, who obtained accuracy scores of 20% on the Token Test, 64% on the CRAB, and 95% on the Western Aphasia Battery subtests. These findings simply reinforce the contention that the extent of auditory comprehension disorders can not be determined on the basis of one or two standard tests.

"In the end, a good rule to remember is that most aphasics comprehend more than the testing indicates" (Benson, 1979, p. 35). Perhaps a future direction for this research is to assess comprehension demands across situations and adapt our diagnostics to better mirror those environments.

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APPENDIX B

Group Performance on PICA, Token Test, WAB, and CRAB

Number	OA%ile	VI%ile	X%ile	TT	WAB	CRAB
6	45	58	54	5%	65%	41%
5	29	17	17	10%	71%	15%
2	34	23	62	15%	80%	21%
4	66	73	99	20%	95%	64%
1	54	53	72	47%	95%	63%
7	41	73	54	52%	98%	85%
8	67	73	47	70%	100%	97%
3	66	63	99	75%	100%	87%
9	47	73	72	75%	100%	82%
10	70	99	72	80%	98%	91%
Range	29-70	17-99	17-99	5-80	65-100	15-97
$\bar{X}$	51.9	60.5	64.8	44.9	90.2	64.6
SD	14.9	24.6	74.5	29.9	13.1	29.8

APPENDIX C

Performance on the CRAB Listed per Conditions of Relevance, Length of Command, and Word Class

	Condition A (+) Related				Condition B (=) Neutral				Condition C (-) Inappropriate			
	1-part		2-part		1-part		2-part		1-part		2-part	
	(10)	(10)	(20)	(20)								
Subjects	A	O	A	O	A	O	A	O	A	O	A	O
2	0	6	0	6	0	6	0	5	0	8	0	7
5	0	4	.5	7.5	1	3	0	5	0	1	1	3
6	4	9	4	15	0	8	0	13	1	8	0	12
1	9	9	12	19	5	9	2	18	1	9	4	17
4	10	10	17	20	7	9	8	17.5	7	10	5	8.5
Low Totals	23	38	33.5	67.5	13	38	10	58.5	9	37	11	47.5
Low % Correct	46	76	34	68	26	70	10	59	18	74	11	48
9	10	10	19	20	7	10	10	20	6	10	9	18
10	10	10	20	20	8	10	14.5	20	9	10	14	19
7	9	10	18	20	7	10	14	20	6.5	9.5	10	20
3	10	10	19	20	8	10	18	20	6	10	8	19
8	10	10	20	20	10	10	18.5	20	10	10	18	18
High Totals	49	50	96	100	40	50	75	100	37.5	49.5	59	94
High % Correct	98	100	96	100	80	100	75	100	75	99	59	94
Group Totals	72	88	129.5	167.5	53	85	85	158.5	46.5	86.5	70	141.5
Group % Correct	72	88	65	84	53	85	40	79	47	87	35	71

Q: How would one respond to the contextually inappropriate commands? It seems like they are very difficult to do . . . tear the candy, wind the paper. It seems the difficulty of the response is probably more salient than the comprehension component of that part of the test.

A: When we developed the test, we gave it to a couple of normals, and they completed the tasks easily. There was no ambiguity in their responses. When the subjects made errors, they usually completed an action, but the wrong action. For example, for the command, "Lick the whistle," the subjects might "Blow the stamp." None of our subjects had limb apraxia. We had thought if we only got responses, like a patient just starts pointing, we would not know anything, i.e., they may only be responding to a test situation, but in fact, they were trying to do these acts. The actions were fairly simple, for example, we used red vine licorice (unwrapped) for our candy which was easily torn.

Q: Can you speculate on how these subjects would do on a paragraph comprehension task? Where would that fall in your hierarchy of performance?

A: First of all, I am not sure that what we are looking at is a hierarchy. It definitely falls out that way but I suspect that we are actually looking at two different things. It looks like we may be asking a patient to perform parallel processing on neutral commands which may have no relation to a command like "pass the salt," which is overlearned and expected. As a guess, I would say that if a patient can understand the redundancy within a paragraph he will do better than if you gave him several sentences that have nothing to do with each other.

Q: Do you notice a trend in terms of the interactions between object comprehension and action?

A: Consistently, objects were better than actions in both one and two part commands.

Q: Were your patients mixed in terms of fluency vs. nonfluency, and if so, did they perform differently?

A: We used both fluent and nonfluent. There was no difference in performance.

Q: Just to follow up on an issue that you yourself raised, you mentioned the alerting function that syntax might play to favor a performance with objects rather than actions. Are you designing a study to investigate that further?

A: Yes we are. We felt it was important to start by holding syntax constant. Probably we don't give enough credit, in most cases, to what we know about the rules of language. When we intersperse some transitives, some intransitives in our auditory comprehension tests we are neglecting these rules. We did not expect our results to come out this radically, and I'm not sure that's the only reason the objects are that much better.

One way to further investigate the issue would be to use transitive only, intransitive only and then to use both and see if that throws a wrench in the works. We need to know how much of a contributing factor it is. I think it's a component of meaning that we don't give enough credit to.

Q: Could you define what an error is?

A: An error was recorded when they did the wrong action. We double scored all responses and had .98 reliability.

APPENDIX: CONTEXTUAL RELEVANCE AUDITORY BATTERY SCORE SHEET

CONTEXTUAL RELEVANCE AUDITORY BATTERY (Rev 10/8/86)
Graham, Holtzapple, LaPointe

Patient: _____ Examiner _____
Date admin: _____
Materials: All ten objects placed in two rows on the table.
Name each object aloud for the patient.
Instructions: "I'm going to ask you to do some things with these objects. Listen carefully, because I cannot repeat any of them. Are you ready?"

CONTEXTUALLY RELATED: ONE PART COMMAND

	ACTION	OBJECT	SCORE/COMMENT
1. Open the bottle			
2. Blow the whistle			
3. Strike the match			
4. Wind the watch			
5. Pass the salt			
6. Eat the candy			
7. Tear the paper			
8. Lick the stamp			
9. Roll the ball			
10. Ring the bell			
TOTAL			

NEUTRAL: ONE PART COMMAND

	ACTION	OBJECT	SCORE/COMMENT
1. Tap the bottle			
2. Lift the whistle			
3. Touch the match			
4. Move the watch			
5. Take the salt			
6. Lift the candy			
7. Tap the paper			
8. Move the stamp			
9. Touch the ball			
10. Take the bell			
TOTAL			

CONTEXTUALLY INAPPROPRIATE: ONE PART COMMAND

	ACTION	OBJECT	SCORE/COMMENT
1. Open the watch			
2. Blow the salt			
3. Strike the stamp			
4. Wind the paper			
5. Pass the ball			
6. Eat the match			
7. Tear the candy			
8. Lick the whistle			
9. Roll the bell			
10. Ring the bottle			
TOTAL			

CONTEXTUALLY RELATED: TWO PART COMMANDS

	ACT	OBJ	ACT	OBJ	SCORE
1.Open the bottle and blow the whistle					
2.Strike the match and ring the bell					
3.Pass the salt and eat the candy					
4.Tear the paper and lick the stamp					
5.Roll the ball and wind the watch					
6.Ring the bell and open the bottle					
7.Blow the whistle and strike the match					
8.Wind the watch and pass the salt					
9.Eat the candy and tear the paper					
10.Lick the stamp and roll the ball					
TOTAL					

NEUTRAL: TWO PART COMMANDS

	ACT	OBJ	ACT	OBJ	SCORE
1.Touch the bottle and tap the whistle.					
2.Tap the match and lift the bell.					
3.Take the whistle and touch the candy.					
4.Lift the paper and tap the stamp.					
5.Move the ball and touch the watch.					
6.Touch the salt and move the match.					
7.Lift the watch and move the salt.					
8.Move the candy and take the paper.					
9.Take the stamp and lift the ball.					
10.Tap the bell and take the bottle.					
TOTAL					

CONTEXTUALLY INAPPROPRIATE: TWO PART COMMANDS

	ACT	OBJ	ACT	OBJ	SCORE
1.Open the watch and blow the salt.					
2.Strike the stamp and wind the paper.					
3.Pass the ball and eat the match.					
4.Tear the candy and lick the whistle.					
5.Roll the bell and ring the bottle.					
6.Blow the salt and strike the stamp.					
7.Wind the paper and pass the ball.					
8.Eat the match and tear the candy.					
9.Lick the whistle and roll the bell.					
10.Ring the bottle and open the watch.					
TOTAL					