

Profiles of Communication Deficits in Patients with Right Cerebral Hemisphere Damage: Implications for Diagnosis and Treatment

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Statement of the Problem

As we all know from personal experience and from the available literature, many right hemisphere patients do not communicate adequately. Their speech has been characterized as copious and inappropriate, as confabulatory, irrelevant, literal, and occasionally bizarre (Brookshire, 1973; Collins, 1976; Gardner et al., 1975; Gardner, 1976). These descriptions were borne out for the most part in work done during the past year with right hemisphere (RH) patients. It was found in the course of interviewing 20 RH patients that communication problems, when they exist, tend to be manifest by irrelevant and often excessive information and by literal treatment of questions and events. Specifically, when responding to open-ended questions such as, "Tell me what happened to you and why you're in the hospital," many patients could address, but not answer, the question. They seemed unable to provide the structure or overview called for by the question. They wended their way through a maze of disassociated detail, seemingly incapable of filtering out unnecessary information. Although they had at their disposal all the components of a narrative, they could not actually assemble them into a narrative. What appeared to be lacking was: 1) the ability to integrate discrete items of information into a whole; and 2) the ability to provide an interpretation of events or situations. For example, when asked, "Tell me about what happened to you and why you are in the hospital," one patient produced the following lengthy answer:

"Wife and I were taking - were visiting Labor Day weekend. We drove our car . . . Saturday before Labor Day weekend. Saturday morning. Let me interrupt myself - my wife and I drove our car from Washington Saturday Labor Day weekend morning. We arrive Saturday afternoon. Visit my in-laws. Saturday evening - after evening I had dinner with my in-laws. Saturday night my wife and I slept in separate rooms - my in-laws, they call it T.V. room. Always we have sleeping quarters. Saturday evening - Sun - Sunday morning when I awoke, my wife gave me breakfast. She gave me toast."

At this point the patient was reminded of the question and he continued:

"I had for breakfast, toast and egg beaters, which I like. Margarine - Fleischman's margarine . . . supposed to be low in cholesterol. My wife went in kitchen. Same - similar thing occurred to me. I was calling her. Apparently my voice sounded different. She looked. She said, 'Ohh! John has a stroke.' She was upset, so upset."

In other cases patients appeared to miss the implication of the question and to respond in a most literal and concrete way. When asked "What are you learning in physical therapy?" another patient said:

"Well, she takes me down and usually I walk around quite a lot. Then she puts me on one of those beds down there - they're not like this, but you know. And, uh, she has me take my leg and pull it up and hold her hand and touch her finger and bring it up to my nose and, uh, go up some steps - there are some steps. Well, I guess yesterday, as I told my grandson, I rode a bicycle for two and a half miles. Well, not actually, but pedalling it."

The overall impression was of speech characterized by difficulty in extracting critical bits of information, in seeing the relationships among them, and in reaching conclusions or drawing inferences based on those relationships. Much of the detail supplied was related to the general topic, but it appeared to be irrelevant because it had not been integrated into a whole. Bizarre, confabulatory responses were rarely seen.

These impressions led to speculation about the nature of the irrelevant and literal responses seen in some RH patients. Recognizing that many of the visual/spatial disorders found in RH damage reflect a deficit in synthesizing sensory input (Joynt and Goldstein, 1975; Ornstein, 1977; Zaidel, 1978), it was hypothesized that the inappropriate verbal output of these patients may be accounted for partly by a deficit in integrating information on a higher level.

This study was designed to discover whether or not the verbal expression of RH patients reflects an extension of their perceptual integration deficits such that they find it difficult to step beyond merely cataloguing information to the level of interpretation.

Methods

Subjects. Eight right-handed adults with unilateral right-sided brain damage were tested. There were four male and four female subjects ranging in age from 60 to 76 years with a mean age of 69.5. Localizing information obtained from each subject's medical chart was verified by computerized axial tomography (CT Scans). One subject had a temporal lesion, two had temporal-parietal, two had fronto-temporal-parietal, and three had occipital-parietal lesions. All subjects had moderate to severe left-sided neglect and were oriented and alert at the time of testing. The control group consisted of education-matched right-handed adults with no history of neurological disease. There were three male and five female controls ranging in age from 60 to 85 years, with a mean age of 71.2.

Tests Administered. Both the experimental and control groups were administered two tests: The Hooper Visual Organization Test (Hooper, 1958) and a picture description test. In addition the experimental group was given 18 subtests of the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan, 1972) as a check against aphasia. In general the results of the aphasia examination revealed that the subjects did not have a language-specific deficit. A composite Z-score profile was drawn up (Figure 1) depicting the mean scores and the range for each subtest. It is interesting to note that the highest and lowest scores for each subtest were scattered across the group.

As its name implies, the Hooper Visual Organization Test is a test of visual integration. Test stimuli consist of 30 line drawings of everyday objects that have been cut into several parts and rearranged (Figure 2). The

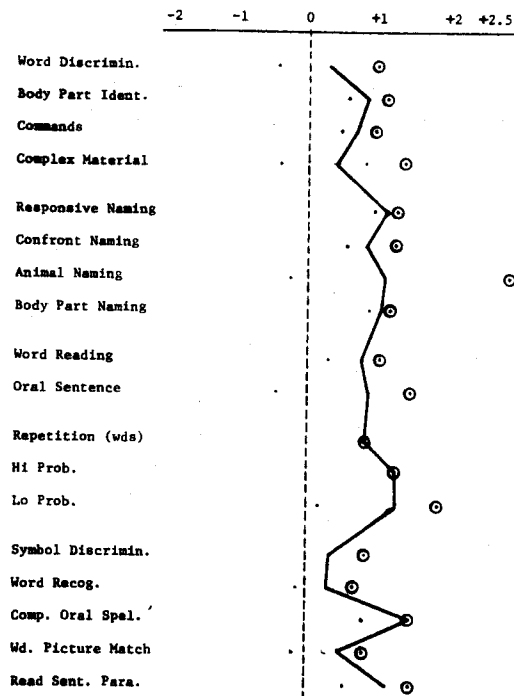


Figure 1. Composite Z score profile. (—)=mean BDAE scores. (O)=highest possible score for subtest. (.)=highest and lowest scores. Shading=range.

stimuli are presented one at a time and the subject is asked to name the object depicted. The stimuli vary in degree of difficulty; there are no time limits.

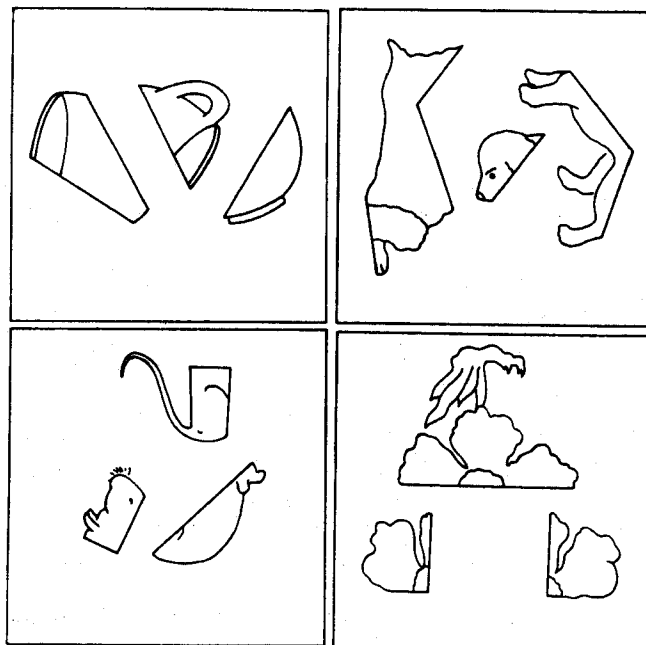


Figure 2. Examples of stimuli presented in the Hooper Visual Organization Test.

As a control for non-integrative perceptual deficits, the experimental group was also given a 30-item matching test in which they were asked to match each of the Hooper stimuli to one of four choices. Every subject received a perfect score.

In the second task both experimental and control subjects were asked to describe the cookie theft picture from the BDAE. Visual neglect in the experimental group was compensated for by placing the picture to the right of the subject and by repeated instructions to look at the left side of the picture. The responses of both groups were taped and transcribed. The transcripts then were analyzed for content in the following manner: a list of concepts or content units mentioned at least once by 31 normal speakers describing the picture (Yorkston and Buekelman, 1977) was divided into literal and interpretive concepts (Table 1). Literal concepts were defined as those that had meaning in isolation - or separate from the context of the rest of the picture (objects, people, and actions). Interpretive concepts were defined as those that had meaning only within the context of the events depicted in the picture. Thus, "reaching up" was considered literal, while "asking for cookie" was considered interpretive. Of the 57 Yorkston and Buekelman concepts, 23 were placed in the interpretive group and 34 in the literal group. Only concepts that appeared on the list, or their exact synonyms, were counted in scoring the transcripts.

Table 1. Literal and interpretive cookie theft picture concepts (After Yorkston and Buekelman, 1977).

Two children	little girl	*mother woman (lady)	*in the kitchen (indoors)
little boy	*sister standing	children behind her	*general statement about disaster
*brother standing on stool	by boy reaching up	standing by sink	lawn sidewalk
*wobbling (off balance)	*asking for cookie	*washing (doing) dishes	house next door open window
3-legged	has finger to mouth	*drying faucet on	curtains
*falling over on the floor	*saying "shhh" (keeping him quiet)	*full blast	
*hurt himself reaching up	*trying to help (not trying to help)	*ignoring (daydreaming)	
*taking (stealing) cookies	*laughing	water overflowing onto floor	
*for himself		*feet getting wet	
*for his sister		dirty dishes left puddle	
*from the jar on the high shelf in the cupboard with the open door			
*handing to sister			

* Interpretive concepts

Three certified speech-language pathologists served as judges. Their task was to count the number of literal and the number of interpretive concepts expressed by each of the experimental and control subjects. The judges obtained an "interpretive score" for each subject by dividing the total number of concepts by the number of interpretive concepts - that is, a percentage of interpretive concepts. Interjudge reliability was measured by a Pearson product moment correlation coefficient denoted by the symbol r . This value was calculated for judges A, B, and C for both individual subject and control ratings. The six r values calculated ranged from .94 to .99, indicating a very high degree of interjudge reliability.

Results

The results of the Hooper Test of Visual Organization for the experimental and control subjects are presented in Table 2. The mean score for the experimental group was 8.0 out of a possible 30 and the mean for the controls was 23.2. The difference between the two groups was analyzed using a t-test and was found to be significant ($p < .01$). The very low

Table 2. Hooper test scores for right-hemisphere-damaged (RHD) and control subjects. (Total Score = 30)

	RHD	Control
1	12.0	27.5
2	7.0	24.0
3	7.0	21.5
4	11.5	24.0
5	11.5	27.0
6	8.0	21.0
7	1.0	18.0
8	6.0	22.5
MEAN	8.0	23.2

scores for the experimental group were not indicative of a "naming" deficit, as can be seen by comparing each subject's scores on the visual confrontation naming (VCN) subtest of the BDAE with their Hooper scores. Even subjects with perfect or near perfect VCN scores received at most a score of 11.5 on the Hooper (Table 3). These results coupled with the results of the Hooper matching task, indicate that the experimental subjects had a visual integration deficit on the perceptual level while the controls did not.

The results of the cookie theft description (Table 4) were analyzed in the following manner: Because of the high degree of interjudge reliability, the interpretive scores for each subject were averaged across the three judges. This resulted in an average interpretive score for the three judges for each subject. These scores were subjected to a t-test and were found significant ($p < .01$). These results show that the experimental subjects had a significantly lower number of interpretive concepts compared to controls.

Table 3. Comparison of Hooper and Visual Confrontation Naming Test scores for RHD subjects.

	Hooper (T=30)	VCN (T=105)
1	12	92
2	7	90
3	7	105
4	11.5	102
5	11.5	102
6	8	93
7	1	90
8	6	80

Table 4. Interpretive scores ($\frac{\text{interpretive concepts}}{\text{total concepts}} \times 100$) for right-hemisphere-damaged (RHD) and control subjects.

	RHD	Control
1	29.33	38.10
2	27.67	52.33
3	24.33	45.67
4	46.33	66.33
5	27.00	59.67
6	37.67	53.33
7	0.00	45.33
8	19.67	31.00
MEAN	26.50	48.97

Discussion

Taken together these results lend support to the hypothesis that RH patients have difficulty integrating information both on a perceptual and on a more formal level and that this deficit is reflected in their verbal output. The actual transcripts are even more revealing of the experimental subjects' tendency to itemize, rather than interpret, information (see Appendix A). It would seem that the next step should be an analysis of those concepts mentioned by RH subjects that do not appear on the Yorkston-Buekelman list, so that the irrelevant concepts can be accounted for even more precisely.

More work needs to be done before definitive statements can be made regarding treatment and diagnosis of RH patients. However, because our approach to the RH patient tends to be so tentative, it is worth considering several implications of this work. First, when faced with a RH patient, we should investigate the nature of his irrelevant verbal output. Is it truly confabulatory and bizarre, or does it consist largely of related, but unintegrated bits of information? Second, is there a difference between his response to highly structured questions versus open-ended ones? If so, one could consider a treatment program that moves from a rigid highly structured stimulus response paradigm to one increasingly open. Certainly, when assessing the patient we should be aware that his response to everyday and automatic conversation may belie a deficit in processing and interpreting more complex external input and in organizing, directing, and channeling internal information.

Acknowledgement

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Appendix A

COOKIE THEFT DESCRIPTION (Experimental Subject)

I see many figures. First time I see woman holding plate. Turn my eyes. See boy standing on table - no, wait, small stool. I see shoes. Boy is opening jar. Feeling cookies, I guess. I describe object - four legged object. I call table. Inaccurate description, I guess. Table looks unbalanced. He might fall. Woman is mother. See girl. Left arm upraised. The boy. Presumably his sister. First detail I see, huh? Hurts eyes - must move eyes like movie camera.

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Discussion

- Q: I have a question for Ms. Myers. I think you said all of your patients had a left neglect.
- A: Yes.
- Q: Two questions then: I wondered if you could tell us about the size of the lesion and also how comfortable are you in generalizing your results to right hemisphere patients who do not have left neglect.
- A: Not comfortable with that. The lesions were...one was in the temporal lobe, there were temporal-parietal lesions, and there was only one that had a little bit of frontal involvement, but it was fronto-temporal-parietal. And there was one who was more severely fronto-temporal-parietal and one with just temporal. The temporal-parietal area seemed to predominate.
- No, I don't feel comfortable...I think that neglect has a lot to do with it...you are going to find these kinds of deficits more in patients who have left sided neglect. The ones that I interviewed that were frontal lesions without any parietal involvement or neglect were much more specific and to the point, very flat affect often, but a different kind of picture.
- A: Penny, did you get to see any of your patients on recovery? Did any of them recover from their neglect and did you observe changes in their behavior?
- A: I did keep in touch with several of the patients. The one that I read the quote from, the very lengthy quote, has improved in that he is aware of what he does. He tries to compensate for it. His neglect cleared a little bit but it is hard to tell how much of that was compensation. He compensates for it a great deal. I think as the neglect clears up you would see less of these problems but I can't make a definitive statement. I haven't been able to follow them up that way...as precisely as would be required to make that kind of a statement.
- Q: Penney, I was fascinated with your presentation and the implications for diagnosis and treatment. I was also fascinated, from your slide, by the apparent listing of things by one patient as he went down. About midpoint or so he referred back to an error he had made earlier. I wonder what you think this might imply as far as integration and management of information...in the sense that this man after going through so much other information went back to an error he had made previously in comments to the other person.

- A: That is an interesting question because some of the patients in these lengthy interviews occasionally would go back and respond again either in self-correcting or a more elaborative way to a question that had been asked maybe five questions earlier. I don't know. It may be that the length of time it takes them to process is affected by the fact that they have difficulty integrating and organizing their information. I really think there is some sort of organizational system or structure that has been disrupted in some way.
- Q: This is just off the top of my head; I haven't really thought it through completely, but it came to me while I was watching. I wonder whether part of this organizational problem or impairment in organization might arise from self-perception and changes that have taken place because of the errors they are making. So that some of the listing might be just their attempt to try to organize their knowledge.
- A: Their experience. Now, what are you saying that would be?
- Q: I'm just thinking that rather than some of this being a direct symptom it might be a strategy. It might be a way of their handling organization---for instance when the man is going through a long routine of what he did that day. I suppose all my friends tell stories somewhat similarly---they seem to be organizing as they go along.
- A: I think it could be looked at as a strategy. But compensating for what? I think it is compensating in some sense for not having their information integrated.
- Q: I'm agreeing with that. I'm just saying that part of it may be arising from self-perception of their errors.
- A: Their self-perception of their errors?
- Q: Penny, I want to ask you---do you see any relationship between integration abilities of patients with left hemisphere damage, a la D. Kimura, and the typical integration abilities that we see in the right-hemisphere damaged patient? We may be talking about the key to the whole situation being organization. We process differently in the right and left hemispheres.
- A: Different ways of processing, yes.