Paucity Vs. Verbosity: Another Analysis of Right Hemisphere Communication Deficits

Elizabeth Hillis Trupe
Medical Rehabilitation Center of Maryland,
an affiliate of Health South Rehabilitation Corporation

Argye Hillis
Section of Biostatistics, Scott and White Memorial Hospital

A growing body of literature on cognitive and communicative deficits associated with right hemisphere damage (RHD) identified impairments in prosody (Schlanger and Schlanger, 1976; Weintraub, et al., 1981; Ross, 1981; Price, 1984), comprehension of figurative language and humor (Gardner and Dene, 1973; Gardner, et al., 1975; Winner and Gardner, 1977; Myers and Linebaugh, 1982; Newhoff, et al., 1984), and perception of nonverbal and contextual cues in conversation (Myers and Linebaugh, 1981; Lundgren, et al., 1984). The verbal expression of RHD patients has been variously described as verbose, inappropriate, confabulatory, unintegrated, and disorganized (Brookshire, 1973; Collins, 1976; Gardner, 1976; Myers, 1979; Lundgren, 1984), but without quantification. Several studies have documented diminished verbal fluency in RHD subjects compared with normal controls, as measured by syllables per minute and Boston Diagnostic Aphasia Examination (BDAE, Goodglass and Kaplan, 1972) rating (Petit, 1984), letter association naming (Petit, 1984; Adamovich, 1981; Milner, 1974) and semantic association naming (Joanette, 1984a). Clinical observation, on the other hand, suggests that some RHD patients are hyperfluent, with digressive and copius speech, while others exhibit a paucity of speech. However, these particular characteristics have not been previously measured or documented. In 1979, Myers measured reduced interpretation and integration of information reflected in verbal picture description and recommended further research to determine the nature of irrelevant verbal output. This study will attempt to: 1) present an additional quantitative measure of verbal output that identifies and differentiates patients with copius/digressive speech and patients with paucity of speech secondary to RHD; 2) analyze the qualitative nature of inappropriate content in the verbal expression of RHD patients.

METHOD

Subjects. Thirty-two males and 30 females, age 44 to 91 ($\bar{X}$ = 68.8), with diagnosed unilateral right hemisphere strokes were studied. Years of education ranged from 4 to 20 ($\bar{X}$ = 11.0). Weeks post-onset ranged from 1 to 12 ($\bar{X}$ = 5.3). Appendix A contains lesion localization data. All subjects were inPatients at the Good Samaritan Hospital and were in the Rehabilitation Medicine program of the Johns Hopkins University School of Medicine. Subjects were referred for evaluation by the speech and language pathology department on the basis of diagnosed right hemisphere damage.

Materials. All patients were asked to verbally describe the "Cookie Theft" picture from the BDAE. Patients were repeatedly directed to look at the left side of the picture if left neglect was indicated. Analysis of the transcribed descriptions included:

1) Number of content units (CU). Concepts or their exact synonyms that were included among concepts mentioned at least once by 31 normal speakers (Yorkston and Beukelman, 1977 and 1980). Subjects' scores

were compared to the mean for non-brain-damaged geriatrics of 14.7±1 standard deviation; 11 to 19 was considered normal.

2) Syllables per CU. Modification of the Yorkston and Beukelman analysis (data derived by C. Linebaugh, unpublished). RHD subjects' scores were compared to the mean for nonaphasic (4.8 to 5.7) vs. aphasic subjects (6.3 to 7.7); below 6.3 was considered normal.

3) Ratio of interpretive concepts to total concepts. CU on the Yorkston and Beukelman list were divided into interpretive and literal concepts (Table 1, Myers, 1979). RHD subjects' scores were compared to Myer's reported range across normal subjects (31 to 66, mean of 49.0).

4) Qualitative analysis of concepts not included on the Yorkston and Beukelman list. Concepts divided into 3 categories: 1) bizarre or unrelated; 2) inaccurate but related to picture; 3) digressive, tangential, or unnecessary detail.

Table 1. Literal and interpretive content units in the "Cookie Theft" picture.

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

Concepts from Yorkston and Beukelman (1977).
*Interpretive concepts from Myers (1979).

The experimental measure chosen to identify and differentiate RHD verbal expression was the number of CU (1) in conjunction with the number of syllables per CU (2), or the amount of appropriate information conveyed in relation to the total amount of verbalization.

Table 2. Comparisons with normative data.

Group	Age (in years)	N	$\bar{X}$ Number of Content Units	$\bar{X}$ Syllables Per CU
All RHD Patients	44-91, $\bar{X}$=69	62	10.3 (5.4)	9.8 (10.3)
Normal Adult	19-49, $\bar{X}$=31	48	18.0* (4.7)	4.8**
Geriatric	58-93, $\bar{X}$=73	30	14.7* (3.6)	5.7**
Aphasic Patients	20-75, $\bar{X}$=45			
Mild		17	16.4* (3.3)	6.3**
High-Moderate		16	14.6* (4.6)	7.4**
Low-Moderate		17	10.5* (2.5)	7.7**

*From Yorkston, K. and Beukelman, D., "An Analysis of Connected Speech Samples in Aphasic and Normal Speakers," JSHD, 45, p.31, 1980.
**Derived from Yorkston's and Beukelman's data, by Craig Linebaugh, 1980 (unpublished).

Table 3. Distribution of content units.

Content Units	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0 - 4	9	14.5	9	14.5
5 - 9	21	33.9	30	48.4
10 - 14	17	27.4	47	75.8
15 - 19 (Normal)	12	19.4	59	95.2
20+	3	4.8	62	100.0
Total	62	100.0		

Table 4. Distribution of syllables per content unit.

Syllables per CU	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0.0 - 4.9 (normal adult)	18	29.0	18	39.0
5.0 - 9.9	29	46.8	47	75.8
10.0 - 14.9	7	11.3	54	87.1
15.0 - 19.9	1	1.6	55	88.7
20.0 - 24.9	2	3.2	57	91.9
25.0 - 29.9	2	3.2	59	95.2
30.0 - 34.9	1	1.6	60	96.8
35.0 - 39.9	1	1.6	61	98.4
40.0 - 44.9	0	0.0	61	98.4
45.0 - 49.9	0	0.0	61	98.4
50.0 - 54.9	0	0.0	61	98.4
55.0 - 59.9	0	0.0	61	98.4
60.0 - 64.9	0	0.0	61	98.4
65.0 - 69.9	1	1.6	62	100.0
Total	62	100.0		

Group	Experimental Definition	Characteristic	N	Amount of Appropriate Information Conveyed (CU: Mean and SD)	Efficiency Syllables/CU (Mean and SD)
1	CU<11 Syllable/CU≥6.3	Irrelevant Speech	25	Meager (6.2 ± 2.9)	Poor (16.2 ± 13.9)
2	CU<11 Syllable/CU<6.3	Paucity of Speech	10	Meager (6.8 ± 2.0)	Normal (4.4 ± 1.6)
3	CU≥11 Syllable/CU≥6.3	Digressive Speech	10	Normal (15.2 ± 3.2)	Poor (9.6 ± 2.3)
4	CU≥11 Syllable/CU<6.3	Normal Speech	15	Normal (14.5 ± 2.2)	Normal (4.2 ± 1.1)
5	CU>22.7	Verbose Speech	2	High (23*)	Normal (5.5)

*More than one standard deviation above the mean of 18.0 for normal adults.

Table 6. Mean scores on standardized tests (SD in parentheses).

Group	N	NCCEA* Word Fluency Score		WMS** Mental Control Score		WMS Logical Memory Score	
Low CU:							
1. Irrelevant	25	13.3	(7.7)	4.0	(2.9)	5.6	(3.4)
2. Paucity	10	18.3	(8.4)	4.9	(1.7)	5.9	(2.7)
CU WNL:							
3. Digressive	10	23.1	(11.2)	6.6	(2.2)	8.7	(3.9)
4. Normal	15	25.6	(13.2)	5.9	(2.0)	7.1	(4.1)
Published Norms		33		6.4+		7.7+	
Difference Between Groups 1-4		p = 0.002		p = 0.01		p = 0.05	

*Neurosensory Center Comprehensive Examination for Aphasia (1979).
**Wechsler Memory Scale, Form I (1972).
+I.Q. groups and age groups 40-94 year-old were combined for WMS subtest norms (Cauthen, 1977 and WMS, 1972).

Table 7. Quality of inappropriate content in picture descriptions. Number of patients in each group exhibiting each qualitative characteristic.

Type of Output	RHD Patient Group 1 Irrelevant	2 Paucity	3 Digressive	4 Normal	5 Verbose
Bizarre, unrelated	8	1	0	0	0
Inaccurate but related	16	4	6	0	0
Digressive, tangential, unnecessary detail	16	2	8	2	2
None	0	6	0	13	0

Table 8. Mean performance on experimental measure and treatment recommendation.

Group	N	Content Units	Syllables per Content Unit
All RHD Patients	52	10.3	9.8
RHD Patients Recommended for Treatment	45	8.8	12.0
RHD Patients not Recommended for Treatment	17	14.4	4.6
Normal Geriatrics	30	14.7	5.7

Table 9. Generalization of qualitative characteristics across stimulus modalities.

Patient	Speech Characteristic	Response to Visual Stimulus ("Cookie Theft" Picture)		Response to Auditory-Verbal Stimulus
MP	Paucity of Speech (meager content)	(complete) "She's washing dishes. Water running over."	Recall of WMS Story B (complete):	"A ship was struck by another ship and tossed around like a cork."
AB	Digressions	(highlights) "...probably cleaning up after a meal. I suppose the meal was an excellent one, very similar to those I am provided...	Recall of WMS Story B (highlights):	"...an American ship, not in America, but in England, probably in wartime because you mentioned mines...you expressed human suffering...terrible things that war wreaks...undoubtedly panic in Liverpool, with many phone calls to the authorities regarding who was rescued..."
EL	Related, but inaccurate content	(highlights) "She's fixing lunch... boy is putting dishes away... handing dishes up...he's tasting cookies"	Recall of WMS Story B (highlights):	"...a steamboat was hit by lightning..."
RR	Tangential content	(highlights) "Well, it's on 8½ x 11 inch paper overall covered by plastic. Looks like it may have been done in drawing pens and India ink on white paper. It's less than 20 lb. paper."	Response to open-ended question, "Tell me what happened to you and why you're in the hospital." (complete):	"Only thing I remember is I was following a routine I usually follow. I was getting puffed wheat. I use puffed wheat. It has an important mineral in it. Then I put bananas on it. I pour milk over it, until it soaks in."
CJ	1) Unnecessary detail 2) Digressions	(highlights) 1) "She has already dried one plate and two cups. So she evidently has two more plates to go..." 2) "They have a garden in other words, so they probably have to do watering each morning, or maybe after sundown in the afternoon..."	Response to above open-ended question (highlights):	1) "...I had vomited there in my pajamas and robe and everything, and my underclothes and night-clothes and everything were all messed up, so he put his arms under my arms and pulled me and asked me what was the matter...he said I answered him and sorta mumbled..." 2) "...we have a very thick rug, what they call a sculptured pattern with swirls and all that, and it goes down to the base, fiber base... our neighbor is Dr. Wong; his medical training is from the U. of Taiwan...two fine boys, they've been trained and educated from the

Table 10. Association between # CU in description and # "Memories" in passage recall.

Group	Content Units $\bar{X}$	Comparison with Normal	WMS Logical Memory Score (# "Memories") $\bar{X}$	Difference from Normal	
All RHD Patients Combined	10.3		6.9	Non-significant; 2 Standard Errors	
RHD Group: 1. Irrelevant	6.2	Low: 5 Standard Errors Below Mean for Normals	5.6	Marked; 4 Standard Errors	Below Normal $\bar{X}$
2. Paucity	6.8		5.9	Probable; 2 Standard Errors	
3. Digressive	15.2		8.7	Non-significant	
4. + 5. Normal + Verbose	15.5	Normal	8.1		Above Normal $\bar{X}$

Patients were also administered an unpublished battery of tests including standardized and nonstandardized assessments. For the purpose of this investigation, 3 subtests were studied: the Word Fluency measure of the Neurosensory Center Comprehensive Examination for Aphasia (NCCEA, Spreen and Benton, 1979) and the Mental Control and Logical Memory subtests of the Wechsler Memory Scale (WMS, Psychological Corp., 1972). It was hypothesized that patients who performed poorly on the experimental measure would perform poorly on these tests which stress attention and vigilance.

RESULTS

Identification of Impaired Verbal Expression. The experimental measure differentiated RHD patients from any other studied group (Table 2). The mean number of concepts expressed by RHD subjects was significantly (3 standard errors) lower than the mean number expressed by normal adult or geriatric subjects or mild or high moderate aphasic subjects. Table 3 shows a normal distribution of CU, with more than one-third of the RHD subjects expressing 5 to 10 concepts (normal = 11.1 to 22.7). The average number of syllables per CU was higher than has been reported for normal or aphasic subjects, but the distribution was quite skewed (Table 4); precluding usefulness of the standard error as a summary statistic. The median syllables per CU (6.6) was within the range reported for aphasic subjects. In addition, the experimental measure identified deficits in verbal expression beyond those identified by Myer's measure of integration and interpretation of information. A total of 17% of patients with impairments by the experimental measure fell within the reported range for normal subjects of percent interpretive content.

Classification of Impaired Verbal Expression. Patients could be classified into 5 groups based on the experimental measure (Table 5). Differences between groups were confirmed by differential performance on standardized tests (Table 6) and by qualitative analysis of their inappropriate verbalization (Table 7). Analysis of variance revealed significant differences between groups in NCCEA word fluency ($p < .001$), WMS mental control ($p < .01$), and WMS logical memory ($p < .05$) scores. Essentially, all differences were attributable to the contrast of groups with low CU vs. groups with normal CU. The most striking association between test performance and verbal output was the highly significant ($p < .0001$) correlation between CU and NCCEA fluency score for all patients.

Group 4 consisted of patients who performed normally on the experimental measure. They also performed normally on tests of attention/memory. Only one (7%) of these patients was recommended for treatment of cognitive/communicative disorders after the evaluation, compared to 44 (94%) in the other groups. Exclusion of these "normal" patients reveals larger differences between RHD and non-brain-damaged subjects in verbal output (Table 8).

Group differences in the proportions of various types of concepts expressed are shown in Table 7. Chi square analysis revealed that low CU was associated with expression of unrelated or bizarre content ($p < .005$). High syllables per CU was associated with expression of inappropriate concepts of any type ($p < .0001$). That is, loquacious patients were more likely than others to produce some type of inappropriate content.

Generalization of Qualitative Characteristics. It is conceivable that the inaccurate and bizarre concepts expressed by RHD patients were attributable to visual deficits rather than communication deficits. However, when picture descriptions were compared to story retellings and responses to open-ended

questions, similar qualitative characteristics were exhibited across verbal responses for each patient. Several examples of patients' responses to visual and auditory-verbal stimuli (Table 9) demonstrate generalization of the quality of their inappropriate speech. Stimuli and complete transcriptions of patient's responses are contained in the appendices.

Additional evidence that verbal deficits generalize across stimulus modalities is that patients with fewest CU in picture description also express fewest concepts or "memories" in retelling passages (Table 10).

CONCLUSIONS

RHD patients may exhibit either copius, digressive speech or paucity of speech, as identified by the experimental measure presented. These characteristics are associated with attention and memory test scores. RHD patients express concepts that are unrelated, inaccurate, or tangential to the stimuli, whether the stimulus is visual or auditory-verbal. Tangential or digressive content is the most common quality. Measuring the number of syllables spoken in attempts to convey specific information is a useful technique for quantifying digressiveness and may have applicability to evaluation and treatment of RHD patients.

DISCUSSION

Earlier studies comparing RHD to normal subjects have presented dissimilar conclusions, such as: the number of expected concepts is reduced in verbal narratives (Joanette, et al., 1984) but normal in written story retellings (Metzger and Jelineck, 1977). The present study demonstrates that there is a reduced number of concepts (CU) in verbal expression of RHD groups 1 and 2, consistent with Joanette, et al., and a normal number of concepts in story retellings of RHD groups 3, 4, and 5, consistent with Metzger and Jelineck. Generalization of findings across RHD subjects may be impossible (and unwarranted) because populations of the cited studies may have differed considerably depending on criteria for consideration and selection. Inclusion in the presnet study was based on diagnosis of right hemisphere damage, rather than on identified cognitive or communicative deficits. Results indicated that greater differences from normal subjects were revealed when criteria included referral for treatment by a speech and language pathologist. Failure to consider the basis for referral of subjects to the examiner may cause unidentified variability in RHD samples, and may account for contradictory findings in the literature. Apparently conflicting results regarding letter association naming scores of RHD subjects, presented by Adamovich (1981) and Petit (1984) vs. Joanette, et al. (1984) demonstrate the inability to generalize across populations. In the current study, patient groups 1 and 2 showed significantly diminished fluency in such a task, compatible with findings of Adamovich and Petit, while groups 3, 4, and 5 showed normal fluency, compatible with findings of Joanette, et al.. Despite reduced "fluency" scores, group 1 patients were hyperfluent with copious, digressive speech in picture descriptions, story retellings, and responses to open-ended questions. Perhaps letter association naming tasks are more useful for measuring cognitive skills, such as task vigilance or thought organization, than for measuring speech fluency in RHD subjects.

While patients in groups 1 ("irrelevant") and 2 ("paucity") sounded dramatically different because of their quantity of verbal output, they were

very similar in every other respect studied. There were no significant differences between these two groups ($p > .1$) in Myer's measure of interpretive content, in tests of attention, or in qualitative characteristics of inappropriate content. In both, the predominant problem was diminished amount of appropriate content. Perhaps these patients suffered from a single underlying deficit--perhaps impaired perception in the broad sense described by Myers (1980). That is, perhaps they had difficulty simultaneously discriminating and interpreting what they saw or heard. When unable to select and integrate critical components of a stimulus, group 2 patients said very little, while group 1 patients said anything that came to mind. Similarly, patients in group 3 ("digressive"), may have had the same underlying deficit in perception, indicated by their frequent digressions and tangential content. They expressed a normal number of appropriate concepts only because they talked for long enough to eventually mention appropriate, as well as inappropriate concepts. These patients appeared similar to RHD subjects described by Metzger and Jelineck (1977) who exhibited more errors and irrelevancies than normal subjects in written recall of a story, but exhibited no difference in the number of facts or general concepts recalled.

The irrelevant, inaccurate, and unnecessary content expressed by RHD patients may all be manifestations of impaired selection and interpretation of stimuli. Such perceptual bases for verbal deficits have been postulated before. Rivers and Love (1980) attributed RHD patients' verbal differences in telling stories about sequenced pictures to impaired interpretation of the stimuli. Gardner and Hamby (1979) concluded that RHD patients' lack of organizational schema in retelling stories resulted from reduced perception of relations among key points in the story.

Whether digressiveness and paucity of speech represent symptoms of different right hemisphere syndromes or different manifestations of a single impairment such as perception might be elucidated by associations with site of lesion. Regrettably, the limited localization data available were insufficient to reveal any such relationship. Clearly, the RHD patients in this study did not exhibit uniform impairments. However, the hypothesized dichotomy of verbosity vs. paucity of speech failed to prove useful in differentiating syndromes, since patients separated on this basis were very similar in all respects studied except quantity of verbal output. Further investigations of clusters of symptoms and their associations with areas of damage are warranted to identify the possible existence of separate RHD syndromes.

ACKNOWLEDGMENTS

The author is grateful to Marcia Roseman, Andrew Jinks, Patricia Linden and Ann Shaughnessy for their contributions in evaluating RHD patients.

REFERENCES

Adamovich, B. and Brooks, R. A diagnostic protocol to assess the communication deficits of patients with right hemisphere damage. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1981. Minneapolis, MN: BRK Publishers, 1981.

Brookshire, R. An Introduction to Aphasia. Minneapolis, MN: BRK Publishers, 142, 43-44, 1973.

Cauthen, N., Extension of the Wechsler Memory Scale norms to older age groups. Journal of Clinical Psychology, 33:1, 208-211, 1977.

Collins, M. The minor hemisphere. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1976. Minneapolis, MN: BRK Publishers, 1976.

Davis, A., Myers, P., Adamovich, B. and Yorkston, K. Treatment of right hemisphere damaged patients (a panel presentation and discussion). In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1981. Minneapolis, MN: BRK Publishers, 1981.

Gardner, H., King, P., Flamm, L. and Silverman, J. Comprehension and appreciation of humorous material following brain damage. Brain, 98, 399-412, 1975.

Gardner, H. and Hamby, S. The role of the right hemisphere in the organization of linguistic materials. Paper presented at the International Neuropsychology Symposium. Dubrovnik, Yougoslavia, June, 1979.

Gardner, H. and Denes, G. Connotative judgements by aphasic patients on a pictorial adaptation of the semantic differential. Cortex, 9, 183-196, 1973.

Goodglass, H. and Kaplan, E. Boston Diagnostic Aphasia Examination. Phila, Lea and Febiger, 1972.

Joanette, Y. and Goulet, P. Is verbal fluency really reduced among right brain-damaged right-handers? A comparison between morphological and semantic criteria. Paper presented at Academy of Aphasia, Los Angeles, 1984.

Joanette, Y., Goulet, P. and Nespoulous, J. Lexical and syntactic features of narratives in right brain-damaged right-handers. Paper presented at Academy of Aphasia, Los Angeles, 1984.

Lemon, P., Burns, M. and Lehner, L. Communication deficits associated with right cerebral brain damage. Presented at American Speech-Language-Hearing Association, Atlanta, 1979.

Lundgren, K., Moya, K., and Benowitz, L. Perception of non-verbal cues after right brain damage. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings. Minneapolis, MN: BRK Publishers, in press.

Lundgren, K. Functional communication deficits following right brain damage: A case study. Paper presented at the 61st Annual Session of the American Congress of Rehabilitation Medicine, Boston, 1984.

Lundgren, K., Moya, K., and Benowitz, L. Communication deficits and rehabilitation in the right hemisphere damaged patient. Paper presented at the 61st Annual Session of the American Congress of Rehabilitation Medicine, 1984.

Metzler, N. and Jelinek, J. Writing disturbances in patients with right cerebral hemisphere lesions. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1977. Minneapolis, MN: BRK Publishers, 1977.

Millar, J. and Whitaker, H. The right hemisphere's contribution to language: A review of the evidence from brain-damaged subjects. In S. Segalowitz (Ed.), Language Functions and Brain Organization. New York: Academic Press, 1983.

Milner, B. Hemispheric specialization: Scope and limits. In F.O. Schmitt and F.G. Worden (Eds.), Neurosciences Third Study Program. Cambridge: The MIT Press, 1974.

Myers, P. Analysis of right hemisphere communication deficits: Implications for speech pathology. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings. Minneapolis, MN: BRK Publishers, 1978.

Myers, P. Profiles of communication deficits in patients with right cerebral hemisphere damage. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1979. Minneapolis, MN: BRK Publishers, 1979.

Myers, P. and Linebaugh, C. Perception of contextually conveyed relationships by right hemisphere damaged adults. Paper presented at the American Speech-Language-Hearing Association Convention, Detroit, 1981.

Myers, P. and Linebaugh, C. Comprehension of idiomatic expressions by right hemisphere damaged adults. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1981. Minneapolis, MN: BRK Publishers, 1981.

Newhoff, M., Salvatore, A. and Parks, J. Sweet sunshine and warm hugs: Aphasics' comprehension of metaphors in context. In R.H. Brookshire (Ed), Clinical Aphasiology: Conference Proceedings. Minneapolis, MN: BRK Publishers, in press.

Petit, J. and Secyal, L. Is there fluency after aphasia? In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings. Minneapolis, MN: BRK Publishers, in press.

Price, B. Right hemisphere function. Paper presented at the 61st Annual Session of the American Congress of Rehabilitation Medicine, Boston, 1984.

Rivers, D. and Love, R. Language performance on visual processing tasks in right hemisphere lesion cases. Brain and Language, 10, 348-366, 1980.

Ross, E. The aprosodias: Functional-anatomic organization of the affect components of language in the right hemisphere. Arch. Neurol., 38, 561-569, 1981.

Schlanger, B., Schlanger, P. and Gerstman, L. The perception of emotionally toned sentences by right hemisphere-damaged and aphasic subjects. Brain and Language, 3, 936-403, 1976.

Searleman, A. A review of right hemisphere linguistic capabilities. Psychological Bulletin, 84, 503-528, 1977.

Spreen, O. and Benton, A. Neurosensory Center Comprehensive Examination for Aphasia. Univ. of Victoria, Neuropsych. Laboratory, Dept. of Psych., 1969.

Weintraub, S., Mesulam, M. and Kramer, L. Disturbances in prosody: A right-hemisphere contribution to language. Arch. Neurol., 38, 742-744, 1981.

The Wechsler Memory Scale (WMS). New York: The Psychological Corp., 1972.

Winner, E. and Gardner, H. The comprehension of metaphor in brain damaged patients. Brain, 100, 719-727, 1977.

Yorkston, K. and Beukelman, D. An analysis of connected speech samples of aphasic and normal speakers. JSHD, 45, 27-36, 1980.

Yorkston, K. and Beukelman, D. A system for quantifying verbal output of high-level aphasic patients. In R.H. Brookshire (Ed.), Clinical Aphasiology: Conference Proceedings, 1977. Minneapolis, MN: BRK Publishers, 1977.

DISCUSSION

Q: Did you talk about neglect at all? Did you have any data on severity or type?

A: No. At that time, we did not have data on the Hooper, or any standardized test. I didn't report on neglect because we didn't have a good definition for it. All but two of the patients had mention of neglect somewhere in their charts, but it was not defined in any way. Either the speech pathologist, the occupational therapist, the nurse, or somebody said "this patient has left neglect."

APPENDIX A

DISTRIBUTION OF LESION SITES (BY CT SCAN) AMONG PATIENT GROUPS

	GROUP				
Lesion Site	1 Irrelevant	2 Paucity	3 Digressive	4 Normal	5 Verbose
Frontal Parietal	2		3	1	
Frontal Temporal	1				
Temporal Parietal	3	3	2	2	1
Parietal	4			1	1
Parietal Occipital				1	
Occipital				1	
Internal Capsule			1	1	
Basal Ganglia	3				

[1]Above numbers represent the number of patients exhibiting the specified lesion.

[2]Remaining 30 patients had right hemisphere lesions documented by EEG or by CT scan with non-specific reports (e.g., "right cerebral").

APPENDIX B

The Wechsler Memory Scale Logical Memory Subtest, Form I, Story B (stimulus):

> The American liner, New York, struck a mine near Liverpool Monday evening. In spite of a blinding snow storm and darkness, the 60 passengers including 18 women were all rescued though the boats were tossed about like corks in the heavy sea. They were brought into port the next day by a British steamer.

APPENDIX C

TRANSCRIPTIONS OF RHD PATIENTS' VERBAL RESPONSES
TO VISUAL AND AUDITORY-VERBAL STIMULI

Stimuli: The "Cookie Theft" picture from the Boston Diagnostic Aphasia Examination, the Wechsler Memory Scale, Logical Memory subtest Story B (see Appendix B), open-ended question, "Tell me what happened to you and why you are in the hospital."

MP (Paucity of Speech)
Picture Description (complete): "She's washin' dishes. Water runnin' over."
WMS Story B (complete): "A ship was struck by another ship and tossed around like a cork."
Stated reason for hospitalization (complete): "I was told I had a stroke."

RR (Tangential Content)
Picture Description (complete): "Well it's on 8½ x 11 inch paper overall covered by plastic. Looks like it may have been done with drawing pens and India ink on white paper. It's less than 20 pound paper. Else you wouldn't have used black to keep it from shining through. I see window and curtain somebody has pulled back and hospital-type curtains exposing a window and utensils on a table, pan or a pot, curtains drawn back with strings tied. Kitchen curtains, no particular design on them. A valance at the top of the curtains with an ordinary angular design. The rest of the curtains only called curtains because of their placement and their overall lack of color. There's evidence that the paper was punched for a three ring binder before it was made. The room seems to be filled with air since the curtains have a billowing effect."
WMS Story B (complete transcription not available) Highlights: "... in the North Atlantic...life boats...learned a lesson from the Titantic."
Stated reason for hospitalization (complete): "Only thing I can remember is that I was following a routine I usually follow. I was getting puffed wheat. I use puffed wheat. It has an important mineral in it. Than I put bananas on it and pour milk over it until it soaks in."

EL (Inaccurate but Related Content)
Picture Description (complete): "The woman is fixing lunch, and the boy is putting dishes away. The girl is handing dishes up. The boy is falling over--I just want to get somewhere where I can put my head down--cookie jar, elephant, flowers, curtains--he's tasting cookies, and the water's being run over."
WMS Story B (complete): "A steam boat was hit by lightning. Let me see, it didn't say how many people, did it? Oh yes, 16 passengers were tossed around in the harbor."
Stated Reason for Hospitalization (complete): "I slipped and in falling hit my head and that made me unsteady, that falling a bit--then when they operated on my head they

thought, 'well, that's enough of that one.' The blood wasn't dry yet. I slipped getting out of the bus."

CJ (Unnecessary Detail and Digression)
Picture Description (complete): "They're cleaning up after a meal and evidently the meal was breakfast and evidently 1, 2, 3, probably 4 members of the family. The wife is drying a dish from an overflowing sink. She has already dried one plate and two cups, so she evidently has two more cups and two more plates to go. There's danger of being an accident. The little boy probably will get hurt when he falls off that stool, so she'll have to administer some emergency treatment very shortly. Through the window you can see that they have some flowers and grass, and they have a garden in other words. They probably have to do the watering each morning or maybe before sundown in the afternoon."
WMS Story B (not available)
Stated Reason for Hospitalization (complete): "I was interested in--baseball is my least favorite sport--I like football and basketball. My husband and I both follow the games very closely. I was watching one--there were lots of people there including Schaefer, William Schaefer. I got overly excited about the game. My husband came in about 11:30 or so and he was tired and he--but he still heard the TV going full blast. So he turned it off and got in bed and then as I say, about half an hour later, he woke up and still heard--and I wasn't in bed, and he said he still heard the TV going full blast. So he got up to come in and see what was keeping me, and he found me in the clothes that I came to the hospital in--the same robe and pajamas and gown and everything and he, and over--we have a very thick rug, what they call a sculptured pattern with swirls and all that. It goes down to the base--fiber base, about 2, more than 2 inches down, deep, and he found that I had--he saw a cigarette out of the box and it um, and as I say one was on the floor and I had vomitted in there in my pajamas and robe and everything and my underclothes and night clothes and everything were all messed up, so he put his arms under my arms and pulled me and pulled and asked me what was the matter and all and I answered him. He said I answered him and sort of mumbled he said, but I did respond and he said I understood him even though I talked a little bit thick in responding to him. So he, as I say, he got everything cleaned up that he could and got me back in bed. Our neighbor is Dr. Wong, his medical training is from the University of Taiwan. My husband called him and he said, you know, the emergency--private ambulance. Naturally my husband paid for that so that's why I'm--it was necessary--it was recommended that I come here, that this is the best for this type of therapy--what you call the living--well, they call it the physical therapy. So he built it up very prominently. And as I say, he has--they're two fine boys, they've been trained and education from the word go."

AB (Digressions and Inaccurate Content)
Picture Description (complete): "In the first picture, it seems like the boy wants to pick up something like a hat.

He seems to be completely and absolutely unaware or negligent of the danger of falling off that chair he's standing on. Woman is probably drying up a washed plate. This is probably cleaning up after a meal. I suppose the meal was an excellent one, very similar to the one's I am provided in this institution. And there's a window, I see through the window some trees. It is important to have a lovely view from your window so that you may appreciate the wonders of God's creation."

WMS Story B (complete): "You discussed a liner that struck a mine in the harbor of Liverpool one evening. The seamen tried to do their best, but the success of the operation was not adequate. There was much confusion because of the many sea gulls and people floating, trying to get something to eat. It was an American ship, not in America but in England, probably in wartime because you mentioned mines. There was some coloration of social work because you expressed human suffering. You had in mind what was necessary to do to improve the terrible things that war reeks and the need to be prepared. The people who are prepared usually win and help others to be successful. You also wanted to help the people psychologically. There was undoubtedly panic in Liverpool with many phone calls to the authorities regarding who was rescued and who was not..." The patient's mention of authorities led his discussion to the Mayor of Baltimore, then to judging people psychologically on the basis of behavior, which led to family life and his daughter-in-law, which led to reading and vocabulary, and finally to "Chicken McNuggets."

Stated reason for hospitalization (complete): "The cause of my physical disability, what I only suspect was, cold. I was standing in the rain, in a downpour, a cold rain, and my head was uncovered, and I was unable to change this situation. After about 5 minutes I felt like my whole head was covered with ice. This I do understand was immediate cause; and the indirect cause I think it was overworking in my professional job. I function on two jobs, so called self-employment jobs. As a matter of fact, on three jobs. First of my jobs, I was priest at St. Michael's Church in Baltimore. I function also as a priest in Ukranian St. Francis Church in Washington, D.C. Additionally, on Saturdays, I was teaching religion in Saturday school in Baltimore and sometimes on request, I performed voluntary social work with Department of Social Services in Baltimore."