Commonality and Differences in Aphasia: Evidence from BDAE and PICA

E. Jeffrey Metter, Walter H. Riege
Veterans Administration Medical Center, Sepulveda, California and
UCLA School of Medicine, Los Angeles, California

Wayne R. Hanson
Veterans Administration Medical Center, Sepulveda, California

David E. Kuhl, Michael E. Phelps
UCLA School of Medicine, Los Angeles, California

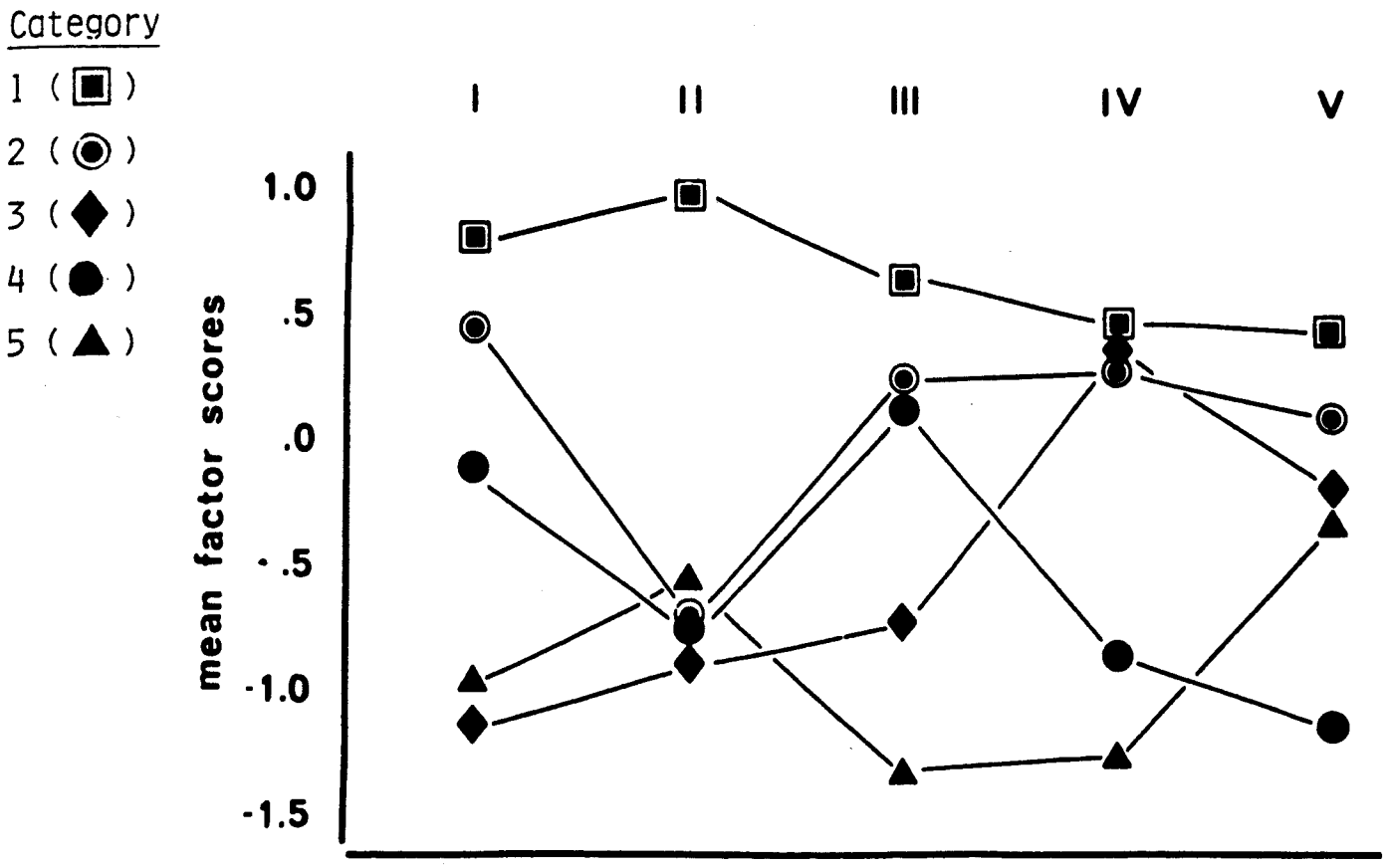
Aphasia classification has traditionally been divided into 2 approaches: a "holistic" one with all aphasia being alike and with adjectives adding little to the understanding of the aphasia; and a "localizationist" one where distinctive syndromes are defined which account for specific features within individual patients. Our concept is that both approaches are correct, but reflect different aspects of aphasia. The holistic approach focuses on commonality of symptoms, while the localizationists emphasize unique differences. The differences between them are reflected by differing opinions and arguments (e.g. see Benson, 1979; Darley, 1982).

To study commonality and differences in aphasic syndromes, we have examined aphasia grouping using two standardized tests: the Boston Diagnosti Aphasia Examination (BDAE) and the Porch Index of Communicative Ability (PICA The BDAE focuses on different aphasia symptoms and classifies clinical syndromes (Goodglass and Kaplan, 1972; Benson, 1979) based primarily on yes/no dichotomies. For example, repetition is either normal or abnormal compared with other language components. The PICA was designed primarily to examine language behavior, being less concerned with classification. The subtests tend to be simpler, focusing on commonality of behavior. We previously explored clinical grouping of 118 aphasia patients using the PICA and identified 5 factors from the subtests and 5 different groups based on cluster analysis (Figure 1) (Hanson, Riege, Metter and Inman, 1982) which were congruent with grouping obtained by Clark, Crocket, and Klonoff (1979).

By exploring clinical grouping using traditional syndromes, and behavior features from PICA groupings, a better understanding may be achieved by describing aphasic patients based on commonality and differences between syndrom A symposium at the 1982 Academy of Aphasia noted that the traditional approac classifies from 40-70% of patients. This results in a large group of mixed aphasias falling between the major syndromes and not being classifiable. Fine separation of clinical syndromes is needed by clinical investigators who may require homogeneous subgroups to answer specific questions, but is restrictive for the therapist who treats all patients. This paper explores the relevance of our previously defined PICA grouping (Hanson et al., 1982) to traditional syndromes in chronic aphasic patients.

METHOD

Fifty-two aphasic subjects were studied more than 3 months after the onset of their aphasia. Each subject was given the BDAE and the PICA within



Factor 1: Speaking (Subtests I, IV, IX, XII)
Factor 2: Writing (Subtests A, B, C, D)
Factor 3: Comprehension (Subtests VI, X, V, VII)
Factor 4: Gesturing (Subtests II, III)
Factor 5: Copying (Subtest E, F)

Profiles of mean standardized scores for the five factors shown above derived from performances on the Porch Index of Communicative Ability (PICA) of the 118 patients were used in cluster analyses which determined five categories of chronic aphasia patients.

Figure 1. Results of cluster analysis.

a short period of time. Patients were classified based on BDAE scores and criteria as presented by Goodglass and Kaplan (1972). Subjects not fitting a specific syndrome formed a mixed group. After the clinical classification, PICA scores were converted to factor scores which formed the data base for clinical grouping which was derived from cluster analysis of 118 subjects (Figure 1). Each subject was placed in one of 5 groups.

CT studies were done as part of the clinical evaluation and were available for 25 subjects. The scans were done on a variety of scanners making quantitative analysis meaningless. A qualitative analysis was carried out by examining major brain regions within the left hemisphere and noting whether there was evidence for infarction involving the region.

Eleven patients were studied with the (F18)-Fluorodeoxyglucose (FDG) method as has previously been described (Huang, Phelps, Hoffman et al., 1980; Reivich, Kuhl, Wolf, et al., 1979; Phelps, Huang, Hoffman, et al., 1979). Subjects were scanned using the ECAT II (Ortec, Oakridge, Tn). The patient was injected with 5 to 10 millicuries of FDG and lay quietly on the ECAT II bed for 40 minutes with neither eyes or ears occluded. The room lights were dimmed, and the patient was able to see and hear the ambient conditions within the room. After 40 minutes, scanning was started at zero degrees to the canthomeatal line. The resolution was 16 mm by 16 mm by 16 mm FWHM. Scans were evaluated by visual evaluation of the tomograms to define the extent of the structural abnormality.

RESULTS

BDAE classification is presented in Table 1, with 29 of 52 (56%) cases categorized into specific syndromes. In the mixed group, 52% had features suggestive of a specific syndrome, particularly with features of anomic or Broca's aphasia, but some aspects of the clinical data were inconsistent. The mixed group tended to have a more severe aphasia, and greater comprehension difficulty when compared with anomic or Broca's aphasia syndromes.

Table 1. Number of subjects with each aphasic syndrome.

Based on Classification with the BDAE	
Wernicke aphasia	5
Broca aphasia	4
Conduction aphasia	1
Anomic aphasia	8
Transcortical motor aphasia	0
Transcortical sensory aphasia	1
Isolation aphasia	1
Global aphasia	9
Mixed aphasia	23
Primarily Wernicke	1
Primarily Broca	5
Primarily Anomic	5
Primarily TCM	1
Based on Classification with the PICA	
Group 1	16
Group 2	15
Group 3	5
Group 4	14
Group 5	2

The breakdown of the PICA grouping is presented in the lower half of Table 1. Comparison of the BDAE classification and PICA grouping are shown in Table 2. Several observations can be made. (1) The aphasias associated with relatively preserved comprehension (Broca's and anomic) were associated primarily with PICA group 1. (2) Aphasias with poor comprehension (Wernicke's and global) were associated with groups 2 and 4. (3) Global aphasic subjects fell into two different PICA groups, 2 and 4.

Table 2. Comparison of BDAE classification and PICA grouping. Under each clinical syndrome, the PICA grouping for each subject with that syndrome is listed. TCM is transcortical motor, while TCS is transcortical sensory. The mixed group is divided based on proximity to specific syndromes. None refers to a completely mixed pattern.

BROCA	WERNICKE	CONDUCTION	ANOMIC	TCM	TCS	ISOLATION	GLOBAL
1	2	2	1 1	-	4	5	2 4
1	2		4 1				2 2
3	4		1 1				4 2
2	2		4 1				2 4
	4						2

PRIMARILY BROCA	PRIMARILY WERNICKE	PRIMARILY ANOMIC	PRIMARILY TCM	NONE
1	4	1	4	1 3
2		3		5 1
3		4		1 4
2		2		1 3
2		4		1 1
				4

Pathoanatomic evaluation by CAT scan was available in 25 subjects. The data are summarized in Table 3. The distribution of lesions for Wernicke and global aphasias was similar, as were those for anomic and Broca aphasias. The two sets of aphasia seemed to differ on the extent of involvement of the posterior temporal regions. Comparing the anatomic lesions to the PICA grouping demonstrated that 2 and 4 showed larger more extensive lesions than did 1, though the pattern of lesion sites seemed similar. This can be seen by noting that for group 1, a total of 9 regions in 7 subjects showed evidence of infarction; group 2 had 22 regions in 7 subjects; and group 4 had 19 regions in 9 subjects.

Eleven subjects were studied by positron computed tomography using (F18)fluorodeoxyglucose. The eleven subjects included 5 clinical BDAE syndromes, while 6 subjects showed mixed aphasias. PICA groups 1, 2 and 4 were represented. All subjects showed metabolic depression throughout much of the left hemisphere independent of the location of the structural lesion. However, group 1 subjects showed less extensive cortical metabolic depression than the other two PICA groups.

Table 3. Comparison of CAT with BDAE classification and PICA grouping in the 25 subjects with scans. Cat scans for each of 25 subjects were judged by a neuroradiologist as being either normal or abnormal for each of the above regions. The number under each region are the number of subjects who showed an abnormality and had the specific PICA grouping or BDAE syndrome. All 25 subjects were grouped into one of the 4 PICA groups listed, while only 15 showed the BDAE syndromes. The first column lists the number of subjects with the specific grouping or syndrome who had a CAT scan evaluated.

	# SUBJECTS	FRONTAL	PARIETAL	BROCA	WERNICKE	TEMPORAL	OCCIPITAL	THALAMUS	CAUDATE
PICA GROUP									
1	7	-	1	2	3	3	-	-	-
2	7	1	6	3	5	5	-	-	2
3	2	1	1	1	1	2	-	-	1
4	9	1	6	2	4	2	1	-	3
BDAE SYNDROMES									
Broca	1	-	1	1	1	-	-	-	-
Wernicke	4	-	4	1	3	4	1	-	2
Conduction	1	-	1	-	1	1	-	-	-
Anomic	5	-	1	2	1	-	-	2	-
TCS	1	-	1	1	1	-	-	-	-
Global	3	1	2	2	2	2	2	-	1

DISCUSSION

The two approaches to grouping aphasic patients produced remarkable differences in describing patients. None of the traditional syndromes related to a single clinical and empirically derived PICA grouping. This implies that the PICA is demonstrating different aspects of aphasic symptomatology than the BDAE does. Overlap was noted, as Broca and anomic aphasias consisted of primarily PICA group 1, while Wernicke's and global related to groups 2 and 4, suggesting that within specific aphasic syndromes, behavioral differences occur which may be of importance. The PICA group 2 differed from 4 (Figure 1) on gesturing and copying. The difference in gesturing may prove important in differentiating the degree of recovery or formulating a treatment approach for these patients.

We, in our previous report on PICA grouping (Hanson et al., 1982) and Clark, Crockett and Klonoff (1979), have suggested that PICA groups may be based largely on overall severity. Severity alone cannot explain the clinical difference observed here. The global aphasic group (those with the severest aphasias) did not fall into group 5, the PICA group showing the lowest mean factor scores. Rather, they primarily fell in groups 2 and 4, similar to Wernicke's aphasia. The implication is that the patterning of factor scores is important and seems more critical than overall severity.

Another observation on global aphasia was the absence of a uniformity in their behavioral abnormalities as demonstrated on the PICA. Based on the traditional syndrome, these individuals obtain the lowest scores on all language subtests from the BDAE without evidence of distinguishing features. Based on the PICA, distinct differences appear to be present, particularly in the degree of gestural abnormalities. The findings identify a subgroup of patients with severe aphasia for whom a gestural approach to therapy might be most appropriate.

Anatomically, the BDAE was designed to predict lesion location while the PICA was not. The BDAE seems more predictive of damage to posterior temporal regions, separating aphasias with greater and lesser comprehension difficulties. The PICA appeared less predictive of lesion site, but differences between groups 1 and 3 and 2 and 4 seem to be present, with 1 and 3 showing smaller lesions than 2 and 4. Similarly with metabolic scans, group 1 seemed to show the least degree of left hemisphere glucose metabolic depression.

The findings from this study suggest that by examining two language tests which focus on commonality and differences in symptomatology a more comprehensive view of aphasia is obtained. The combined approach demonstrates features which together appear to result in better understanding and may suggest more appropriate therapies. The PICA can group patients based largely on gestural differences, an aspect of language not directly tested by the BDAE. The BDAE seemed better at distinguishing anatomic difference--primarily the degree of temporal lobe involvement, while the PICA results seemed more related to lesion size. These observations suggest that both holistic and localization approaches, when taken together, can allow for better understanding of aphasia, with the major difference between the two views being how test results are analyzed.

REFERENCES

Benson, D.F., Aphasia, Alexia, and Agraphia. New York: Churchill Livingstone, 1979.

Clark, C., Crockett, D., Klonoff, H., Empirically derived groups in the assessment of recovery from aphasia. Brain and Language, 7, 240-251, 1979.

Darley, F.L., Aphasia. Philadelphia: Saunders, 1982.

Goodglass, H., Kaplan, E., The Assessment of Aphasia and Related Disorders. Philadelphia: Lea & Febiger, 1972.

Hanson, W.R., Riege, W.H., Metter, E.J., Inman, V.W., Factor derived categories of chronic aphasia. Brain and Language, 15, 369-380, 1982.

Huang, S.C., Phelps, M.E., Hoffman, E.J., Sideris, K., Selin, C.J., Kuhl, D.E., Noninvasive determination of local cerebral metabolic rate of glucose in man. Am J Physiol, 238, E69-E82, 1980.

Phelps, M.E., Huang, S.D., Hoffman, E.J., Selon, C.S., Sokoloff, L., Kuhl, D.E., Tomographic measurement of local cerebral metabolic rate in humans with (F-18) 2-fluoro-2-deoxyglucose: Validation of method. Ann Neurol, 6, 371-388, 1979.

DISCUSSION

Q: You group the patients on the PICA from 1 to 5 i.e. 5 different types. In Figure 1 there were spikes here and there. Did you find that this was mainly due to severity differences or were there qualitative differences?

A: When we originally reported that study (Hanson et al., 1982) we felt that it was probably very heavily a severity scale. In this study, we noted that global aphasic subjects did not follow the severity model. We would predict that they would be in group 5, the group with the lowest mean scores. It really looks like the patterning differences may be of importance. This stood out in particular when one looked at the group of global aphasics. The patients we accepted as global aphasics bottomed out on the BDAE. Anybody who didn't, we placed in the mixed group. The PICA really appeared to be looking at the behavior in a different way than the BDAE.

Q: Could it be that the BDAE was educationally biased while the PICA was not?

A: These patients were all from the Veteran's Administration Medical Center and ranged from the individuals with third grade educations through Ph.Ds and M.As.

Q: May I suggest to you that many of the patients from the VA do bottom out on the BDAE and are not global. Is that a possibility?

A. I haven't looked at our data in those terms in relation to the BDAE. If you look at the PICA, I can tell you that Ph.D.'s who take it can appear quite aphasic.

Q: Did you rule out perceptual deficits in these patients?

A: No we didn't

Q: I got a little lost in the last discussion about education and the BDAE. As I remember, you classified people on the BDAE. You weren't using total

scores or severity measures or anything. You classified them on the rating scale of speech characteristics. The behavior involved there is to get somebody to give you some general information, describe a picture, and converse with you. Then you add in the auditory comprehension scores, and probably check the repetition scores to classify them. That doesn't take a lot of education to do that kind of task. I really don't understand what the point was.

Q: Jeff, one of your colleagues, Klaus Poeck, has observed that classifications of aphasic patients are artifacts of the blood supply to the left hemisphere and don't really say anthing about differences among patients beyond differences in blood supply. Would you care to comment on the implications of that for your study and classification in general?

A: Last year at this meeting I presented our data on FDG. It so happened that we had 11 subjects in our study who were studied with positron tomography and were included in this study. When you look at classification both using the BDAE and the PICA based on metabolic differences, not blood flow differences, we couldn't tell the difference between one group and the other. So far it seems that classification based on anatomic localization tends to correlate best with structural rather than functional lesions, where by functional I mean either blood flow or metabolism. We tend to see greater changes in blood flow and metabolism in the hemispheres than you see structurally. I don't know what will be seen in NMR, but at least from pictures that I have seen NMR will represent the effects of edema in addition to the structural damage. We may well add a different phase, examining not only structural damage but the effect on water distribution changes in addition to how functional changes occur. It becomes a very complex picture.

C: When we correlated language test findings from the BDAE and PICA with our FDG findings, there was a distinct separation in where they localized within the brain. The PICA was much more anterior, while the BDAE was more posterior. There was a distinct separation in terms of those tests and our FDG findings.