APHASIA in Adults

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DIAGNOSIS, PROGNOSIS, AND TREATMENT

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Preface

This monograph is the outgrowth of fifteen years of systematic observation of aphasia on the Neurology Service of the Minneapolis Veterans Administration Hospital, in association with the Division of Neurology, Graduate School of Medicine, University of Minnesota. It is the result of continued efforts to increase our understanding of the nature of aphasia in order to deal more effectively with the problems it presents. We have learned about aphasia from studying some thousand aphasic patients, and much of what we have learned has been put to daily use in the clinic. Our patients have contributed willingly in the hope that their observations and their efforts might benefit other aphasic patients and other students of aphasia.

Because aphasia is a many-faceted subject we have chosen an inter-disciplinary approach for this book. One of us is a speech pathologist (H.S.), another an experimental psychologist (J.J.J.), while the third is a clinical neurologist (E.J-P.). We have studied patients together, and all of us have asked questions and made observations, which in turn have stimulated new questions and new observations. If we have no final answers, we can at least derive comfort from Wendell Johnson's penetrating question, "What is there to scratch but the surface?"

In this book we have devoted a good deal of space to a review of the literature on aphasia, in order to show how knowledge has accumulated slowly from the time of Franz Joseph Gall to the present. At the same time, it has become evident that it is no longer tenable to think of aphasia in terms of discrete cortical lesions and isolated pure disorders. We have proposed a conceptual model for aphasia that is based on clinical and research findings and is compatible with modern neurophysiological and linguistic theory. We have described five major and two minor aphasic syndromes, with group data, prognoses for recovery from aphasia, and illustrative case material. We have presented analyses of data obtained from 157 aphasic subjects, including factor analysis and correlations with neurological findings; test-retest data for 73 subjects; and results obtained from testing 50 nonaphasic patients with a comparable age distribution. Finally, we have included a section on the management of aphasic disorders.

This is not a book for anyone who is looking for recipes or prescriptions

or final truths. It is intended for all serious students of aphasia, whether their interest stems from concern with language, cerebral function, or behavior. It seems obvious that something is to be learned about all of these processes from the study of the alterations produced by cerebral injury or disease and that this kind of study is essential to both the clinician and the researcher.

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The investigation was supported by Public Health Service grants B1948 and HB-03364 from the National Institute of Neurological Diseases and Blindness. These grants made it possible to process a quantity of data and to refine and distill the results of earlier explorations.

A fifteen-year study must owe much to many people. We wish first to acknowledge indebtedness to Dr. A. B. Baker, Dr. Joe R. Brown, and Dr. Royal Gray. In 1948 Dr. Baker and Dr. Brown established the Aphasia Section of the Neurology Service of the Minneapolis Veterans Administration Hospital, in association with the Division of Neurology, Graduate School of Medicine, University of Minnesota, and clearly defined its teaching, research, and clinical functions. Dr. Royal Gray succeeded Dr. Brown in 1950, and has maintained a firm commitment to the program.

It is improbable that a small highly specialized program could have survived fifteen years without strong administrative support. We wish to express appreciation to Dr. John A. Seaberg, Dr. A. Falk, Dr. Henry Vogl, Dr. Stanley Crosbie, Dr. Edward Mandell, Dr. Werner Simon, Dr. Herbert S. Wells, Dr. Leslie Zieve, Dr. Maynard Cohen, Dr. Wendell Johnson, Dr. Bernard Anderman, and Dr. Donald Causie for their part in facilitating the program and solving the problems that arose at various developmental stages.

Significant contributions were made by Dr. Bryng Bryngelson, Dr. Ernest Henrikson, Dr. Spencer Brown, Dr. William Schofield, Dr. David Lykken, and Dr. Frank Lassman as consultants at various periods. In addition, Dr. Starke Hathaway, Dr. Paul Meehl, Dr. Charles A. Strother, Dr. Wendell Johnson, and Dr. Gerhardt von Bonin have served as occasional consultants, giving generously of their time when special problems arose.

Since 1948 the clinical staff of the Aphasia Section has consisted of the director and two clinicians. From that date, the staff roster has included Margaret Cochrane Pearce, Joyce White Ford, Virginia Burke Carroll,

Norma Walcher Biondo, Barbara Stansell Street, Ruby Mitchell Simmons, Lydia Landis Holquist, Jayne Nelson, Amy Bricker, Barbara Seyler Thomas, and Joyce Williams Sefer, all of whom have been deeply involved with all aspects of the program.

Research associates Jane Gaff Lee, Barbara Stansell Street, Frances Capobianco, Penelope Demos Lawrence, and Gloria Galvin Seacat, have tested series of subjects used as controls and for evaluating experimental tests. Joan d'Andrea and Duane Martin have worked as graduate research assistants, and Lucille Fabian, Carol Bell Fisher, and Jewel Carpenter, assisted by Iris Benson and Curt Engelhard, as statistical clerks. The chief responsibility for preparation of the manuscript has been carried by Jewel Carpenter, assisted by Carol Fisher and Curt Engelhard.

Illustrations were prepared by the Medical Illustrations Service of the Minneapolis Veterans Administration Hospital.

For critical reading of the entire manuscript and detailed and perceptive chapter-by-chapter criticism, we are deeply grateful to Dr. Gerhardt von Bonin. For invaluable comments and suggestions on various parts of the manuscript, we are further indebted to Dr. Royal Gray, Dr. Wendell Johnson, Dr. Joe R. Brown, Dr. Ernest Henrikson, Dr. John Jenne, Dr. Newman Guttman, Dr. Bela Julesz, and to Dr. Leon D. Harmon, Robert Bross, and Dr. George A. Miller.

We also wish to express our warm appreciation to our friends and colleagues whose work on aphasia or related fields has stimulated our thinking. Many of them have shared their observations with us freely and have generously given us permission to cite their studies or discuss their ideas. It is not to be expected that all of us should agree, always, for too many pieces of the puzzle are still missing, and the design cannot yet be seen in its entirety. Until we know all the answers, disagreements will continue to be provocative and valuable for continued research.

Acknowledgments are due to the following sources for permission to use specific materials: American Psychological Association; *Brain;* Cambridge University Press; the Ciba Foundation; Grune & Stratton, Inc.; Harvard University Press; Hoeber Medical Division, Harper & Row; International Universities Press; *Journal of Speech and Hearing Research; Language and Speech;* The Macmillan Company; Princeton University Press; *Psychological Review; Rehabilitation Literature;* W. B. Saunders Company; Society for Research in Child Development, Inc.; Charles C Thomas; *Word;* and to George Stewart whose words are quoted in the chapter titles of Section One.

Finally, to the colleagues, patients, and clients who have contributed freely of their experiences, their observations, and their ideas about aphasia, and generously given us permission to make use of them in this book, we can only offer our recognition of what we have shared and of our common purpose.

Minneapolis, Minnesota

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Introduction: The Development of a Research Program

The Evolution of a Test Battery

We constructed Form 1 of the Minnesota Test in April, 1948 (Brown and Schuell, 1950). We needed uniform test procedures in order to compare performances between patients and performances of the same patients from one time to another. We hoped to find out which symptoms were reversible and which were not, and what changed in relation to what. For this, a comprehensive battery of tests graduated in difficulty was needed.

We asked what you could observe in the behavior of aphasic patients that distinguished them from nonaphasics. The obvious thing that was different was language behavior. The next question was what we could observe about language behavior.

It is possible to observe when subjects understand or fail to understand spoken language under controlled conditions. It is possible to observe similar behavior with reading materials. It is possible to make observations about the way people talk, the way they write, and about their ability to manipulate other common symbol systems such as numbers. Some of this behavior can be evaluated by conventional achievement-type tests.

We asked, also, to what extent aphasic and nonaphasic subjects differed in nonverbal behavior. To answer this we explored responses to various kinds of performance tests, such as the Goldstein-Scheerer Color-Form and Stick Tests, block-tapping, block-design, object-assembly tests, Raven's Progressive Matrices, the Bender Gestalt, and other projective tests.

The third question we asked was why aphasic subjects could not perform specific tasks, when they could not. The procedure, here, was to observe the behavior in question until we were able to make some sort of hypothesis about what was operating and then to construct tests to evaluate the hypothesis.

We continued to use new tests experimentally, tabulating and studying responses obtained from both aphasic and nonaphasic subjects. For example, we wondered if patients failed to identify body parts because of the somatic or because of the part-whole relationship, and added a test requiring identification of parts of a bicycle. We found no evidence of specific difficulty with parts of objects. On all recognition and naming tests errors increased when less common words were used. We found occasional patients, however, who showed evidence of impaired perception of body schema.

To test the concept of *anomia,* and the inference that aphasic patients have more difficulty recalling nouns than other parts of speech, we constructed a test requiring various parts of speech in response to simple questions, such as *What do you shave with? What do you do with a razor?* Patients who answered the first question with a statement such as, "I have it back there," usually said something like, "Well, on your face," in response to the latter. We concluded the difficulty lay in producing a specific rather than a general response, regardless of grammatical form.

Patients responded better to some tests than to others. They tended not to like unusual tasks, such as those involving nonsense syllables, for example, and generally responded negatively to them. On other tests, responses tended to be equivocal, and we did not know what was operating. Sometimes we could revise test items or test instructions to secure less ambiguous responses. When we could not, we dropped the tests.

We used pass-fail scoring whenever possible. When qualitative judgments were necessary, we collected responses made by a diversified group of patients, analyzed and rated them, and established empirical scoring criteria.

We recorded test scores on data sheets as soon as we completed an examination. At the end of each year we tabulated and studied the obtained distributions, and revised the test battery. In general we revised to simplify administration and instructions, to eliminate tests that were duplicated by other tests or seemed not to yield meaningful information, and to add other tests we considered useful or promising.

Eventually we eliminated most performance tests, because, although they discriminated between brain-injured populations and those without brain injuries, they either contributed little to our knowledge of aphasia, or we found we were getting the same kind of information from other tests. Some tests tended to be failed initially, but passed on retest when patients were better able to grasp and retain instructions. This was particularly true of many of the tests for "abstract attitude."

In 1954, we administered the test battery to a population of hospitalized patients with no history of neurological involvement. We tested 40 subjects, and found that while nonaphasics made scattered inconsistent errors, there was only one record that resembled an aphasic pattern. This was the test of an older patient. We concluded that any population including 50- and 60-year-old subjects might contain individuals with previously undetected brain damage, resulting from arteriosclerotic changes, subclinical strokes, or other causes. Resultant mental changes were often interpreted as forgetfulness, and attributed to age rather than to brain damage. These patients showed mild aphasia, as well as other mild neurophysiological symptoms.

In 1955, we completed the sixth overall revision of the test, and made it available to hospitals and universities for experimental use. The 1955 Research Edition, Form 6, was used in the present study. (A description of the tests used appears in the Appendix of this study at page 405.)

Paraphasic Responses

We recorded all the paraphasic responses, the word changes and word substitutions patients made on naming and reading tasks during treatment periods. We were struck by the similarity of these responses to those normals produced on word association tests. We found that in general the word-finding errors of aphasic patients fell into the categories of word associations defined by Jung (Schuell, 1950). This is the first clear-cut indication we had that the language behavior of aphasic patients, bizarre as individual responses sometimes appeared, was predictable and orderly and related to general laws governing language behavior.

Impairment of Auditory Comprehension

Another early observation was that there appeared to be a relationship between difficulty understanding spoken language and available speech. We tried to document this, to see if the evidence supported the clinical impression (Schuell, 1953). We had test and retest records for 138 aphasic patients who had been studied throughout a period of treatment. Using pre-established criteria, we divided the subjects into four groups determined by the amount of speech present at discharge. The groups were essentially as follows:

Group A, excellent speech (N 35), defined as ability to discuss previous interests, without obvious impairment.

Group B, good speech (N 47), defined as speech that usually sounded normal in everyday situations, but broke down when subjects tried to express long or complicated ideas.
Group C, limited speech (N 25), defined as ability to communicate needs and wishes through intelligible but limited or defective speech.
Group D, no functional speech (N 31), defined as inability to express needs and wishes voluntarily, although some kinds of language responses occurred.

Next, we tabulated errors on tests for auditory comprehension on initial examinations. All subjects made errors on tests ordinarily passed by non-aphasics. More than twice as many subjects in Groups C and D as in Groups A and B made errors on all tests except one. This was the most difficult test, paragraph comprehension, on which 99 percent of subjects made some errors.

The easiest test required pointing to common objects named by the examiner. No subjects in Groups A and B and only four subjects in Group C made any errors on this test. However, all 31 subjects in Group D failed some items. This meant that out of 107 aphasic patients with functional speech, less than four percent made errors on this test. In contrast, 100 percent of subjects who regained no functional speech with intensive therapy failed some items. Thus we had not only confirmed the original hypothesis but had also found a simple test with high predictive value.

We recorded the complete initial and final test scores of these 31 subjects. All of them had been considered neurologically stable at the time of initial examination. The data yielded a consistent picture of severe damage, amounting to almost complete loss of function in all language modalities on both initial and final testing. Thus the study led to identification of a test profile for which prognosis for recovery from aphasia was clearly negative.

It was puzzling to find patients who scored above the 90th percentile for normal adults on the Ammons (1948) test for auditory recognition of words but made errors following simple directions. One day, however, we found a patient who could not write sentences like *The grass is green,* or *We have a new car* to dictation, although spelling tested at sixth grade level. On a hunch the examiner repeated the sentences, but dictated them in two- or three- rather than four- or five-word units. This time the patient wrote the sentences easily and correctly.

This clearly pointed to a retention span difficulty. We constructed tests to explore this probability. We found patients who could point to items

in a picture when they were named singly, but not when they were named in series of two, or three. Some patients could follow simple directions, but not two or three of the same directions combined. For patients who could talk, repetition of sentences equated for word frequency but progressive in length showed the same difficulty dramatically. The cut-off points were sharp. The same effect appeared on repetition of digits forward.

This turned out to be a highly reversible phenomenon. We found, moreover, that performance tended to improve in all language modalities as retention span increased.

Classification of Patients

We had studied several hundred patients before we began to see clear-cut evidence of recurring patterns of impairment.

Error patterns can be dramatic. Not only does the same patient make the same kinds of errors every day over periods of weeks or months, but new patients come along and repeat the same errors day after day.

We had identified the test pattern of severely impaired patients with no functional language skills in any modality. We had worked with these patients enough to know what happened with intensive treatment. We knew they could learn to repeat and to copy, to count, and recite the alphabet, the days of the week, or even the Lord's Prayer, if someone started them. They learned to produce reactive responses to high strength associations or other strong stimuli. They could usually match simple printed words to pictures. But no matter how much practice we provided, language never became voluntary or functional in any modality.

The next time we analyzed test data we extracted the records of these patients and copied them on separate data sheets. We found the expected homogeneous set of error distributions. It seemed a good idea to contrast these with the records of patients who showed no gross visual or motor disturbances. The results looked highly consistent, in spite of differences in severity between subjects, and between initial and final tests. In general, patients in this group made no errors on easy tests, but errors increased in all modalities as length of stimuli or length of required responses increased.

There were other records that looked much the same on tests for auditory comprehension and tests for speech and language, but differed markedly on tests involving matching, copying, reading, and writing. We studied these profiles. The records clearly reflected aphasia with additional involvement of visual processes.

Next we looked for records that showed motor involvement without specific visual signs, and detached this group.

The remaining records showed evidence of both visual and motor impairment. This analysis identified a group of subjects we had not recognized as clinically homogeneous. All of them had some residual language in one modality or another. Some had severe motor impairment, but only mild visual involvement. Others showed only mild slurring of speech, but visual involvement was severe. One patient showed mild involvement of both processes.

When we looked at the background data we found this was the most homogeneous of all the groups identified. There were only five patients in this first sample, but they were all over 60, they were all hypertensive, and all of them had had more than one cerebrovascular accident. Later we found that although these details differed in other subjects, the neurological findings were always compatible with scattered or generalized brain damage.

For several months we reviewed all new test records with our psychological consultants, seeing the patients to verify the findings, and classifying them independently. Agreement was remarkably high.

The system made sense to the neurologists. We had a file of test–retest records as well as clinical experience from which to determine prognosis. This enabled us to make predictions on completion of initial testing, if patients were neurologically stable. We included classification and prognosis in the initial case summaries, which were placed in the medical charts. The results began to be impressive, and we gradually acquired confidence in them.

We continued to work with severely impaired patients. We developed new techniques for intensive stimulation to try to penetrate the barrier that seems to exist between reactive responses on the one hand, and voluntary control of language on the other. The intensive methods produced accelerated results for patients in all the other categories, but we were forced to conclude that there is a level of language deficit at which functional recovery is not possible.

Further data, to be presented later, have confirmed the original patterns of deficit identified here and the prognoses attending these classifications. Additional patterns have been recognized from time to time, but these have occurred so rarely, at least in the population of some 1,000 aphasic patients whom we have studied, that we consider them minor rather than major aphasic syndromes. In view of the infinite complexity of the brain, of cerebral processes in general, and language processes in particular, we

consider it probable that aphasic patients will continue to be found who fit neither the major nor the minor patterns of impairment identified. Any classification system would be suspect if this were not true. A simplification of complex behavior so gross as to be all-inclusive would have little clinical or theoretical value.

The Evolution of a Research Team

In 1956 Dr. James Jenkins became a member of the consulting staff of the Aphasia Section of the Neurology Service. He was interested in aphasia because of his work in psychology of language and was able to suggest many fresh and sophisticated approaches to the complex problem of dealing with skewed distributions, test construction, and pattern analysis. In 1958 Dr. Edward Jiménez-Pabón became interested in the interrelations between neurological findings and results obtained on the aphasia examination, and in the sensitivity of aphasic findings as a diagnostic tool for neurologists. He performed painstaking neurological examinations on all the patients in the present study who were in the hospital after this date, reviewed the medical charts of all patients in the study, and assisted in coding the medical data.

Dr. John B. Carroll was interested in the test data that had been coded and punched on IBM cards, and subsequently became a collaborator in the factor analysis study. His extensive experience with factor analysis and with machine programing, as well as his long-term interest in language behavior, made his contribution invaluable. It assumed special importance because of the modifications of statistical procedures made necessary by the characteristic skewness of aphasic distributions.

It is our prejudice, perhaps, that the most heuristic methods of investigation of aphasia involve searching observation and exploration of the language behavior of large numbers of aphasic patients over extended periods of time. Machines can only work with information we give them, and can only answer questions we know how to ask. Probably the most important thing we have learned from our research program is to ask better questions.

Grant Fairbanks once said that what matters about information is the quality of the mind it is sifted through. Perhaps not much can be done about quality of mind, but patient sifting of data can be rewarding, and sometimes it has been exciting.