

Theoretical and Methodological Considerations  
in Aphasia Research and Practice

Response to Caramazza: Information Processing

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Tonight we are concerned with theoretical and methodological issues in aphasia. What will evolve will undoubtedly reflect a continuum of viewpoints, purposes and concerns in the study of acquired language disorders analogous perhaps to the seven blind men encountering the elephant. Along this continuum those on the high road hope to find basic mental mechanisms that can be demonstrated in well-controlled experiments. Those in the clinical trenches want to understand and to help to modify the specific manifestations of language disruption in aphasic adults. The perspective I will present is that of a clinical teacher of aphasia with an interest in and a beginning understanding of information processing. As such, I will respond to Dr. Caramazza as a clinical teacher and also take the opportunity to present selected observations from information processing that in my opinion should be considered in developing a unified understanding of aphasia.

Dr. Caramazza has presented a compelling critical analysis of the logic of drawing valid inferences about the structure of normal language processes from the study of patterns of acquired language dysfunction in aphasic patients. He has purported that, given certain assumptions in cognitive neuropsychology (Caramazza, 1984; Badecker and Caramazza, 1985; Caramazza, 1986), only the single-patient method allows valid inferences about the structure of cognitive systems from the analysis of aphasic performance and that current aphasic categories are theoretically vacuous.

Dr. Caramazza's concern for method in cognitive neuropsychology and his criteria of adequacy for relating data to theory set a commendable scientific standard. He clearly sets the problems, prescribes the methods, and defines the range of possible hypotheses. Certainly we would all agree that the course of advancing knowledge is marked by the questions asked and the strategies of inquiry employed. However, one might ask if a dual research focus in aphasia isn't legitimate: (1) to test a construct/model or theory and/or (2) to detail specifications of a construct/model or theory through a disordered population. Certainly no clinician would argue that understanding normal processing and discovering different underlying mechanisms for aphasic disturbances aren't vitally important issues, but studies directed at documenting similarities and differences in disrupted language also appear valuable since they provide us with clinical knowledge of aphasic language. A dual research focus would have the potential of enhancing a theoretically sound and clinically meaningful understanding of aphasia.

In 1984 Dr. Caramazza (1984) initially presented the assumptions that must be made to use the data from aphasia to constrain models of normal language processing. He suggested that "the logical plausibility of the fractionation assumption and the two conditions it subsumes, the modularity and transparency condition, does not imply that it is empirically reasonable, or that we should accept it without question" (Caramazza, 1984, p. 11). The major empirical justification he cited for the fractionation assumption was the established view that language functions are dissociable in aphasia. He further drew on the well-documented existence of classical differential

patterns of language impairment in the literature. This seems curious, even circular, given his assertions concerning the theoretically vacuous nature of classical patient classification.

Dr. Caramazza has presented well-articulated methodological cautions and has strongly endorsed the single-case method in aphasia research. Consistent with his endorsement is the increased interest in single-subject design (Davis, 1978; Rosenbek, Becher, Shaughnessy, Collins, 1979; Kitzelman, Deal, and Wertz, 1981) and its use by clinical aphasiologists. As recently as last year's Clinical Aphasiology Conference Brookshire (1985) suggested that single-case designs resolve many of the difficulties in carrying out research on questions related to delivery of clinical services in aphasia that using traditional group design might impose. Thus, single-subject designs have merit for the purposes of both the cognitive neuropsychologist and the clinical aphasiologist. However, single-subject designs are not problem-free as both Drs. Caramazza (1984) and Brookshire (1985) have noted. Brookshire suggested "single-case designs usually are considered to be somewhat weaker than group designs in the confidence with which one can generalize results from the experiment proper to other settings, or from the sample of subjects studied to the population represented by the sample. In single-case designs...one always runs the risk of erroneous generalization if the subjects studied are not representative of the population to which the results are to be generalized...Almost always, replication across subjects and...settings will be needed to establish confidence in the generalization of results. Unfortunately, such replications often are neglected" (Brookshire, 1985, p. 12). Dr. Caramazza (1984) has also raised issues of replication and extension for testing alternative interpretations of the symptom complex identified in the single case. In 1984, he noted that extensions logically subsume replications and this implicitly involves classification.

While Dr. Caramazza states that replication studies implicitly involve classification, he also argues that current aphasia classification systems are inadequate for research purposes. Concerns with classification are reminiscent of the 1983 Clinical Aphasiology Conference Panel, "Aphasia With and Without Adjectives." Time is not conducive to doing justice to the salient points presented by clinical aphasiologists like Aten, Darley, Duffy, Holland, Ulatowska and Wertz; however, some quotes are appropriate. Duffy observed that "both sides of the aphasia with and without adjectives issue often argue their points while recognizing legitimate points made by the other, and that many...of their differences are related to different goals, different methods of evaluation, and different samples of patients who command or demand our interest or attention (Duffy and Ulrich, 1976)" (Duffy, 1983, p. 285). This observation would appear to hold true for tonight's discussions as well. Duffy continued that "at the core of the aphasia with or without adjectives issue is whether aphasia varies only along a severity continuum, or whether there are separate and distinct types of aphasia which reflect breakdown of different aspects of language as a function of lesion locus and how language is organized in the brain" (Duffy, 1983, p. 285). Few clinical aphasiologists deny that severity plays a very strong role in producing variations in performance; others are divided on whether to classify or not; and most are perplexed by the findings (Wertz, 1983) that classical systems using various diagnostic tools, e.g. the BDAE and the WAB, are not reliable. Yet the fact remains that the research in aphasia has repeatedly documented differentiated patterns of language disturbance in aphasia. What do these research findings mean? Could a "psychologically

weak notion of syndrome" (Caramazza, 1984) or post hoc groupings in place of a priori categorizing by traditional typologies (Caramazza, Berndt, and Brownell, 1982) be helpful in understanding these clinical patterns?

Responding to Dr. Caramazza as a clinical teacher, I have raised several questions. They have included: (1) the legitimacy of, at least, dual purposes in aphasia research; (2) Dr. Caramazza's use of classical differential patterns of language impairment in the literature to justify the fractionation assumption given his criticism of classification; (3) the issues of replication and extension in single-case studies; and (4) issues of severity and classification in aphasia and the potential usefulness of post hoc groupings in place of a priori classification.

Let us turn now to selected observations from information processing in order to highlight a shift in emphasis from invariant structures of the mind to flexible processes with the potential of variability. Early information processing models, starting with Broadbent in 1958, were concerned with the analysis of data received by the sensory systems. These data driven, or bottom-up, models could account only for the physical characteristics of the voice such as intensity and quality. In 1968, Donald Norman presented a comprehensive theory of information processing which incorporated the conceptually driven, top-down influences on processing. The top-down influences are the expectations formulated by an individual in response to ongoing analysis of the situational context and from the individual's prior knowledge. Current processing models thus represent an interactive system driven by two kinds of inputs: sensory data received from external sources which triggers bottom-up processing, and conceptual data generated from internal sources which is utilized in top-down processing.

Information processing can be further described according to the cognitive processes of attention, memory, perception and comprehension. Although frequently separated for purposes of discussion, these processes are highly interrelated and interactive.

When modern cognitive psychology began to appear based on the new conceptions of information and coding that had emerged after World War II, memory was among its central concerns. Time does not permit extensive review; however, the conceptual framework of the psychology of memory includes a number of valuable ideas--that memory is influenced by mental "scripts" or "schemata" (Bartlett, 1932; Bransford and Franks, 1972; Rumelhart, 1975; Anderson, 1977; Bower, Black, and Turner, 1979); that distortions of memory are often motivated by the needs and character of the individual (Freud, 1956); and that a person's general knowledge, or "semantic knowledge," must be distinguished from his recollections of specific events, or "episodic memory" (Tulving, 1972).

Since retrieval of information stored in long-term memory is critical to comprehension of auditory stimuli, the organization of semantic memory has been of considerable interest. Two major types of organizational systems have been hypothesized: network models (Collins and Quillian, 1969, 1972; Rumelhart, Lindsay, and Norman, 1972; Kintsch, 1972, 1974) and feature models (Rips, Shoben, and Smith, 1973; Smith, Shoben, and Rips, 1974). Noteworthy is the notion that comprehension is a constructive process in which incoming information is integrated into the existing structural arrangement so that a new structure is formed and the individual's representational system is revised.

Information processing models of language comprehension attempt to delineate each storage and control process between the reception of stimuli and the meaningful response (Massaro, 1975; Hayes-Roth, Mostow, and Fox,

1978). Cognitive research has emphasized that auditory linguistic input is never into a static system but into one which is organized continuously by the functional state and previous experience of the individual. As such, auditory linguistic processing appears to be a function of how the signal is integrated with the internal states of the individual; e.g. attention, knowledge and expectations, which are in part independent of stimulus conditions (Lemme and Daves, 1982). Bransford, in emphasizing the constructive nature of comprehension, states that meaning is not carried in words. The sentence "it was cool because the window was closed" is understood to mean an air-conditioned room, although this concept is not mentioned.

As we have come to understand higher-level functioning and comprehension of language, the active involvement of the individual in constructing meaning has been highlighted. An individual's knowledge, expectations and attitudes contribute to central organizational patterns which prepare and directly influence the selection and processing of sensory information. Lemme and Daves (1982) have noted that "any complete theory of auditory linguistic processing needs to account, at least, for the capacity to organize...the acoustic signal into a pattern consistent with the structured verbal message as well as to account for the functional state and previous experience of the individual" (Lemme and Daves, 1982, p. 373). While a complete integrative theory of auditory linguistic processing awaits continued multidisciplinary exchange and research, a shift of emphasis from invariant structures of the mind to flexible processes with the potential of variability has clinical and perhaps theoretical significance for aphasia. McNeil 1986, (in press) is the first to present an integrative information processing structure of auditory comprehension and processing in adult aphasia. He believes that the auditory comprehension and processing disorders in aphasia cannot be explained fully as a language or as a communication disorder. Further, he suggests that a more basic physiological and information processing approach may yield a more fruitful understanding of these disorders and more efficacious assessment and treatment. I encourage your consideration of this departure from the current paradigm that governs approaches to the theory and clinical management of auditory comprehension and processing in adult aphasia. I encourage each of us to stretch our own "schemata" of aphasia to include constructs from information processing which emphasize the constructive nature of processing and flexible processes with the potential for variability.

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