Verbal Performance in Aphasic Patients in Response to Intact and Altered Pictorial Stimuli

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Aphasiologists traditionally have been interested in factors that influence the language performance of aphasic adults. We suspect that variations in verbal performance are demonstrably task related. Today, by presenting one exploratory study, we address the issue of differential verbal responding in aphasic patients; more specifically, description and naming responses generated to visual stimulation utilizing intact and altered pictures of common objects.

Telegraphic, agrammatic speech is the predominate verbal behavior in a nonfluent aphasic speech pattern consisting of: 1) short phrase length, 2) substantive word choice, 3) absence of normal prosody, 4) slow rate, and, 5) articulatory errors (Goodglass, Quadfasel, and Timberlake, 1964; Howes and Geschwind, 1964; Benson, 1967). Naming to confrontation may be good relative to spontaneous speech production (Geschwind, 1967). Grammar is simplified and reduced but not deviant (Goodglass, Gleason, Bernholtz, and Hyde, 1972). Telegrammatism is observed in spite of what has been reported to be the apparent availability of a full range of grammatical constructions (Gleason, Goodglass, Green, Ackerman, and Hyde, 1975).

Clinicians have traditionally used stimulation methods to enhance verbal responding. The theoretical base of a stimulation approach to therapy rests largely on the interference view of aphasia (Schuell, 1965; Martin, 1975) which presupposes a reduction of efficiency in the processing of all aspects of the language code rather than an actual loss of specific language units or functions amenable to reeducation. Luria (1972), in speaking of the effects of lesions involving the anterior parts of the speech areas, observed a loss of normal neural plasticity with the appearance of pathological inertia, as contrasted to patients with posterior lesions, where the actual loss appears to be for selectivity of mental processes owing to a breakdown of the "rule of force" in damaged cortical areas. Recently, Chapey, Rigrodsky and Morrison (1976) have taken a related position, in stating that aphasia can be viewed as both a convergent and a divergent semantic impairment. The convergent component consists of inability to produce highly organized, systematically stored semantic behaviors. The emphasis in divergent behavior is on variety, quantity, and relevance of output from the same source. For nonfluent aphasic patients the ability to diverge appears substantially impaired.

To stimulate fluent verbal behavior, various procedures involving the manipulation of stimuli both internal and external to the organism have been tried. Weigl's (1970) deblocking technique made use of prestimulation in intact modalities. Beyn-Shokor Trotskaya (1966) stressed prestimulation with salient words that expressed complete thoughts to overcome telegrammatic tendencies. Melodic Intonation Therapy (Albert, Sparks, and Helm, 1973) uses strong prosodic stimulation as a technique to facilitate verbal responding. In addition, much research emphasis has been placed on identifying the facilitating characteristics of auditory and verbal stimuli. Darley (1976) in his recent summary of the research, concludes that the more realistic, redundant, salient, prominent, and unambiguous the stimulus, the more likely it is to trigger associations and retrieve responses.

The implication is that an increase in informational redundancy is necessary for response activation. Goodglass, Barton, and Kaplan (1968) supported the notion of a process intervening between the perception of a stimulus and the arousal of its name. If the stimulus possessed strong sensory characteristics, it might arouse linguistic associations as well as facilitate intersensory processes. This cluster of associations engendered by the perception of an object was considered to constitute the concept of the object. These authors speculated that the concept itself activates the speech processes. Hebb (1949) reminded us that verbal symbols are linked not just to a specific object but to a larger concept of the object that involves an interrelated matrix of associated subsystems.

The recent recommendation of West (1977, 1978) is that speech pathologists select materials, particularly pictures, that vividly arouse nonverbal images. Heightened perceptual imagery, she suggests, by differentially involving the right hemisphere, may facilitate response retrieval and mediate between the primary concept of an object or action and the verbal code with which it is associated.

Bruner (1973) describes an iconic stage of representation in the emergence of cognitive processing systems characterized primarily by image processing in terms of single perceptual attributes. The iconic stage is a transition between the earlier enactive stage, where past events are represented through motor response, and the later developing symbolic stage, when language provides a means of representing and transforming experience. Both enactive and iconic image processing continue to be available to us as alternate cognitive processing strategies. Clinicians may be able to manipulate image processing, according to West, as a strategy to retrieve the verbal symbolic code in aphasic patients. In her summary of research, she comments that pictures are more likely to evoke imagery than words and that the more concrete the pictorial stimulus, the more likely it is to evoke a strong sensory image. Gardner's (1973) study has been cited frequently to underscore the influence of "operativity" on the naming capacity of aphasic patients. Those objects that are manipulable, with heightened appeal to multiple sensory modalities and which recall basic motor and sensory experiences, were easiest to name.

The question entertained at the beginning of our study was how to manipulate visual stimuli given a picture of a common object. We wished to create a condition of image arousal that, while permitting convergent naming behavior, might induce divergent verbal behavior. Visual stimulation with the picture of a singular, intact object is generally designed to elicit naming to confrontation. This approach is constrained in effectiveness by a lack of meaningful context and by highly propositional, metalanguage overtones. Considerable attention has been devoted to improving the naming function in aphasic patients despite evidence that such effort may result in limited or negative change in patients' naming performance (Brookshire, 1971). We began our exploration by altering a dimension of the visual stimulus and presented pictures of objects in both "broken" and intact states. The experimental instruction "Tell me what you see," was chosen to minimize focus on a specific semantic label and hopefully induce a greater divergence of responding across both stimulus conditions. Specifically, we asked whether perception of the additional state of "non-intactness" had alerting properties sufficient to generate:

1) the name of the object;
2) a greater number of verbalizations than the presentation of a pictured object in its functionally intact state;
3) a greater number of topically related words; and,
4) an expanded mean length of utterance.

It was hypothesized that the broken object as a stimulus would:

1) enhance and focus iconic image processing by emphasizing an additional perceptual attribute;
2) induce more divergence in responding by recalling a larger number of associations interrelated with sensory and motor interactions of the object in use;
3) stimulate formulation of underlying thought at the primary level of semantic intent synonomous with Lashley's (1951) determining tendency.

We felt this type of presentation would be congruent with the advice of Wepman (1976) to stimulate thought processes in therapy. (We wish you would probe your own subjective experience and recall the phenomenon of taking ordinary objects for granted—that is, until they break, when more than a moderate degree of arousal and disequilibrium ensues.)

Procedures

Subjects. The subjects were 13 right-handed male aphasic patients (Table 1) with a mean age of 56.9 years. Time since onset of aphasia ranged from 6 months to 28 years. Mean number of years of education was 13.4 with a range of 7 to 17 years. All were patients enrolled in speech therapy at the Long Beach Veterans Administration Medical Center or the Los Angeles Veterans Administration Outpatient Clinic. Twelve subjects had experienced a single CVA restricted to the left hemisphere and 11 had residual right hemiplegia. The etiology of aphasia for one patient was a gunshot wound. English was their only premorbid language. Twelve of the patients were tested with the Porch Index of Communicative Ability (Porch, 1967) and the Boston Diagnostic Test for Aphasia (Goodglass and Kaplan, 1972). Table 1 presents mean overall and sub-test scores for the PICA, and the Boston Visual Confrontation Naming sub-test mean score. Of the 13 subjects, 10 were classified as having an anterior (Broca's) type of aphasia and were nonfluent using guidelines by Goodglass, Quadfasel, and Timberlake (1964). Three of the subjects were classified as having a posterior (Wernicke's) type of aphasia and were fluent. All nonfluent subjects were rated as having some degree of apraxia of speech but no significant dysarthria. Naming deficits from PICA and Boston scores were rated moderate in severity for 10 patients and severe for 2 patients.

Stimuli. The stimuli consisted of 20 common one- and two-syllable nouns divided into two balanced word lists as shown in the appendix. The words in each list were equated for number of syllables and occurrence of initial phoneme. They depicted common objects or clothing. Care was taken to

Table 1. Descriptive data for aphasic subjects (N=13).

	MEAN	RANGE
AGE (Years)	56.9	49-68
EDUCATION (Years)	13.4	7-17
MONTHS POST ONSET	96.69	6-345
PICA SCORES	NONFLUENTS (N=9)	FLUENTS (N=3)
OVERALL	11.84	10.61
VERBAL		
I	8.60	8.30
IV	11.59	7.57
AUDITORY		
VI	14.63	12.73
X	14.40	14.90
VISUAL NONVERBAL		
VIII	14.9	14.9
BOSTON		
VISUAL CONFRONTATION NAMING	61.1	----

balance the words in each list for frequency of occurrence in English based on the Thorndike-Lorge word count of written English (1944). Three of the words in each list occurred 100 or more times per million and the remaining seven occurred with frequencies ranging from one to 48 times per million. Each noun chosen met the criteria of picturability according to Barton's (1969) guidelines. The 20 pictures were bold, black and white line drawings with a minimum of ambiguity and were 3x5 inches in size.

Stimulus Delivery. The experiment involved two conditions. In Condition A, the 10 pictured objects were presented in their functionally intact state. For Condition B, the 10 pictured objects were depicted in a broken or altered state so that they were no longer functionally intact (e.g., a pair of glasses was pictured with one broken lens). All 20 pictures were presented to each of the individual subjects in a random sequence and the procedure was replicated within two days of the initial presentation. The instructions were: "I am going to show you some pictures of everyday things and I want you to tell me what you see. Here is the first picture. What do you see?" The instruction was repeated if no responses were noted in one minute. No further cues were given.

Response Analysis. All responses were tape recorded for subsequent analysis by the two authors. A modified rating scale was chosen to score naming responses according to Brookshire (1972). This method assigns "1" for unrelated or unintelligible responses, "5" which identifies an immediate, correct response. Verbalizations, defined as any identifiable utterance produced in response to a stimulus presentation, were tabulated. For more detailed analysis, extraneous comments were deleted from the total number of verbalizations to derive a measure of topically related words. Introductory comments, asides, exact repetition and general concluding remarks such as, "Wait a minute," "I can't say," "Hard to remember," "That's all" were eliminated from the protocols. To determine the mean number and length of topically related utterances, related words were considered to be contained within uninterrupted grammatical strings. The procedure for this type of language sampling analysis was introduced by Yorkston and Beukelman (1978). As such, our earlier gross compilation of mean number of topically related words was equated for all further analysis with the number of words appearing within grammatical strings. A grammatical string was defined as an intelligible word or series of words which have a grammatical relationship to each other. A string is broken if a grammatical error occurs, when a falling intonation pattern clearly indicates the end of an utterance and just prior to the second "and" of a compound sentence, (e.g., "broken pencil"; "tore it"; "and pocket"; "the rake is too"; "has too many teeth broken"; "the shirt was"; "a hole in it"). The mean number of grammatical strings was tabulated in addition to the mean string length (MSL) and the mean of the three longest strings (M3SL). Analysis concluded with a tabulation of the number of simple, active, declarative sentences under each condition.

Results

Table 2 presents group means and standard deviations for the 10 nonfluent and 3 fluent subjects. The means represent combined Day 1 and Day 2 performances. Scores obtained for the separate measures were determined to be homogeneous for both presentations and this finding permitted pooling of the data for analysis. Correlated t-tests were computed contrasting the following measures:

Naming. The t-test analysis of mean difference for the naming task was not significant. Correct naming scores were similar for each condition for both groups of subjects with little variability across conditions or trials. The nonfluent subjects' error responses were analyzed using Brookshire's (1972) criteria for occurrence of unrelated and related responses. Six of the subjects produced one or more unrelated responses under Condition A (intact stimulus condition). Of these six subjects, only one patient produced unrelated responses under Condition B (altered stimulus condition), reducing by one half the number of unrelated responses he generated for Condition A. Sixty-five percent more related responses were obtained for Condition B. This difference in distribution was mainly due to the reduction of unrelated responses under Condition B.

Verbalizations. For the nonfluent subjects, Condition A resulted in a mean number of 90.5 verbalizations over the 2 trials as contrasted to a mean of 148.0 verbalizations for Condition B. This difference was significant at the .01 level. The verbal behavior of the fluent aphasic patients showed no

Table 2. Group mean and standard deviation for measures of verbal performance in nonfluent aphasic subjects (N=10) and fluent aphasic subjects (N=3)

	CONDITION A (INTACT)		CONDITION B (BROKEN)		t
	MEAN	SD	MEAN	SD	
NONFLUENT					
MEASURES					
NAMING	15.0	3.56	16.0	3.80	1.50
VERBALIZATIONS	90.50	33.85	148.0	59.89	5.26*
TOPICALLY RELATED WORDS	73.0	36.49	127.50	61.61	5.68*

*p < .01

	CONDITION A (INTACT)		CONDITION B (BROKEN)		t
FLUENT					
NAMING	7.0		7.2		
VERBALIZATION	210.8		183.5		

significant difference for the verbalization conditions. Their response diversity made further analysis impractical.

Topically Related Words. Condition A resulted in a mean number of 73 topically related words while an average of 127.5 topically related words was generated for Condition B. This result was significant at the .01 level.

Grammatical Analyses. The mean number of topically related words was considered for further analysis and computation as constituting the semantic units within grammatical strings (Table 3). The mean number of uninterrupted grammatical strings tabulated for Condition A was 31.0 as contrasted to 43.4 for Condition B. Computation of the mean string length (MSL) involved dividing the number of words by the number of strings. This result was a mean string length for Condition A of 2.35 words generated in grammatical relationship and an average of 3.03 words for Condition B.

Table 3. Grammatical analyses of verbal responses in nonfluent aphasic subjects.

	CONDITION A (INTACT)	CONDITION B (BROKEN)	t
MEAN # TOPICALLY RELATED WORDS (IN GRAMMATICAL STRINGS)	73.0	127.5	
MEAN # GRAMMATICAL STRINGS	31.0	43.4	
MEAN STRING LENGTH (MSL)	2.35	3.03	
MEAN OF 3 LONGEST STRINGS (M3SL)	5.43	8.93	3.01*
MEAN # SIMPLE ACTIVE DECLARATIVE SENTENCES	5.7	11.3	

(*p < .01)

To quantify a measure of best performance, the mean of the three longest strings (M3SL) was computed for both stimulus conditions. The 10 subjects produced a M3SL of 5.43 under Condition A and a M3SL of 8.93 under Condition B. This difference was significant at the .01 level.

The mean number of simple active declarative sentences for Condition A was 5.7 contrasted with a mean of 11.3 for Condition B. Two of the subjects produced no active declarative sentence constructions under either experimental condition. Three patients who produced no sentences under Condition A did generate 1, 2, and 6 sentences respectively under Condition B, e.g., "It's broken in two"; "The sleeve is busted on the left side." For the remaining subjects the reader will note that twice as many sentences were generated under Condition B as under Condition A.

Discussion

Descriptions generated under the altered stimulus condition were not limited to the addition of single words such as "broken," although this modifier did occur with relative frequency. The majority of responses were notable attempts to describe the specific visual content (e.g., "glasses is cracked," "has a leak in it," "the sleeve is torn," "the pencil snapped," "the toothbrush is bristle missing"). Only three of the patients enhanced their descriptive statements by engaging in spontaneous problem solving, (e.g., "Mend my shirt," "they should shut the faucet down," "throw it away").

Presenting nonfluent aphasic patients with pictures of broken objects generated an increased number of topically related words and an increase in the mean of the three longest uninterrupted grammatical strings. Additionally the name of the object was produced as frequently under the broken condition as under the intact condition, although a name was not specifically requested in the instruction. When the name was not elicited, an increased number of related over unrelated responses was evoked.

As a variation on the traditional naming task, presenting pictures of broken objects with a more open-ended instruction is seen as one method to elicit efficiently not only retrieval of a name but increased quantity and variety of verbal expression. Such was at least true for all 10 nonfluent aphasic subjects in this study, where reduced quantity and flow of verbal utterance is a problematic deficit. Our findings may have additional import as a visual deblocking technique for patients who perform poorly in direct confrontation naming tasks. The subject with the most severe anomia produced two names under the intact stimulus condition as contrasted to 7 names under the broken condition.

Traditionally, clinicians have stimulated aphasic patients with simple, unaltered pictures or objects to elicit one-word naming responses. In his recent review of the research, Darley (1976) commented that stimulating at the "word level" may not be the preferred procedure for maximum stimulation. Wepman (1967) suggested content and ideas be used to stimulate fluency. The clinical significance of this study may be simply that manipulating the visual content of the stimulus items did appear to aid verbal performance. Non-intact objects may serve to stimulate "go" strategies in nonfluent aphasic patients (Whitney, 1975).

Based on our study, we would suggest that continued attention be given to adding prominence to stimuli. Considering West's (1977, 1978) plea that clinicians reduce their reliance on static stimulus materials, our pictorial breaking of the traditional static object has been one attempt to break the verbal code as well. We suspect that the altered condition effect is due to the arousal of multiple associations surrounding the concept of the object; associations related to fundamental sensory and motor experiences of the object in use. We suspect that the instruction, "Tell me what you see" facilitated divergence in verbal recall and facilitated perceptual as well as higher symbolic processing strategies.

The altered stimulus may have produced, by virtue of its novelty, some degree of dishabituation. Sokolov (1960) stated that an orienting reaction, or dishabituation will occur if a repetitiously experienced configuration of input is changed along any of its parameters. Pribram (1971) remarked that when the brain is challenged by novel input, an increased amount of uncertainty leads to active searching and sampling behaviors. As such, distributed information in the brain is more readily accessible.

Our results using the "broken" state may not apply to alteration of other visual dimensions. It is recommended, however, that further study and trials of stimulus variation be employed. Our word lists were relatively homogeneous in terms of frequency of occurrence. Future studies should consider using less commonly occurring words and utilize both convergent instructions (e.g., "Tell me the name of this") and those that may evoke a more divergent set to respond. Varying pictorial stimuli with controlled degrees of complexity while maintaining practical themes may be one approach congruent with Holland's (1977) plea for "functionality" in therapy.

APPENDIX

Items presented in word list A (Intact) and word list B (Broken) with frequency of occurrence in English according to Thorndike and Lorge (1944).

Word List A Intact	Times Per Million	Word List B Broken	Times Per Million
gate	100	saw	100
shoes	100	book	100
cup	100	coat	100
pen	50	shirt	47
belt	48	pencil	40
cane	19	comb	19
scissors	8	rake	13
razor	7	hose	9
tie	6	toothbrush	3
hanger	3	glasses	1

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