Heightening the Action Imagery of Materials Used in Aphasia Treatment

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Research with normal subjects indicates that action imagery results in better paired associate and free recall learning than does static imagery (Paivio, 1971, 1975). One theoretical implication is that action imagery calls on holistic or parallel processing skills and implicates the right hemisphere, while no such advantage accrues for static imagery. If this were so, then it would behoove the aphasiologist to heighten the effectiveness of his treatment and/or diagnostic material by incorporating action imagery whenever possible.

Thinking about action imagery, however, has led to issues related to verb selection; considering how to classify verbs has been a major stumbling block in setting up appropriate experimental or clinical paradigms for use in our clinic. Furthermore, considering how to illustrate those actions that might be selected complicates the issue even further. All in all, the problems raised have proven much more complex than anticipated. Consequently, this is not the very practical clinical paper that I had wished it to be. It is also not a paper that presents current experimental data. Rather, what I propose to do here is identify some of the issues that I view as problems of significance to a clinician faced with selecting appropriate treatment materials.

George Miller (1972) stated, "It is a psychological commonplace that we do not take experience neat, but select, categorize, label, and elaborate it before we store it away in memory (p. 335)." It is the thesis of this paper that we speech pathologists have tended to categorize our aphasic patients, locking them into becoming "It's a _____" aphasics by our emphasis in treatment on nouns and labeling activities. Chafe (1970) stated, "the verb in a sense is the sentence; whatever affects the verb, affects the sentence as a whole (p. 168)." He pointed out that in every language a verb is present semantically in all but a few marginal utterances (p. 96) and took the position that it is the verb which dictates the presence and character of the noun, rather than vice versa. Aphasia therapy, on the other hand, tends to be "noun-centered," even though in 1966 Beyn and Shokhor-Trotskaya hypothesized that if therapy were structured to always express a cognitive unit, telegrammatism could be eliminated. A recent exception to "noun-centeredness" is Nancy Helm's (1977) syntax stimulation program which is based on a hierarchy whose complexity rests entirely within the verb phrase.

A primary reason for my interest in action imagery is the presumed impact of imagery on the right hemisphere. To put the matter at its simplest, visual imagery is believed to heighten right hemisphere functioning (Gazzaniga, 1974; Paivio, 1971; Seamon, 1974; Seamon and Gazzaniga, 1973; West, 1977). Action imagery heightens visual imagery. Therefore, using action imagery with left brain-damaged patients will heighten the functioning of the intact, right hemisphere. Would that life could be so simple, but this is the essence of my interest in this topic. An early

study by Wapner and Werner (1957) showed that dynamic imagery resulted in better paired associate learning than did static imagery (Figure 1).

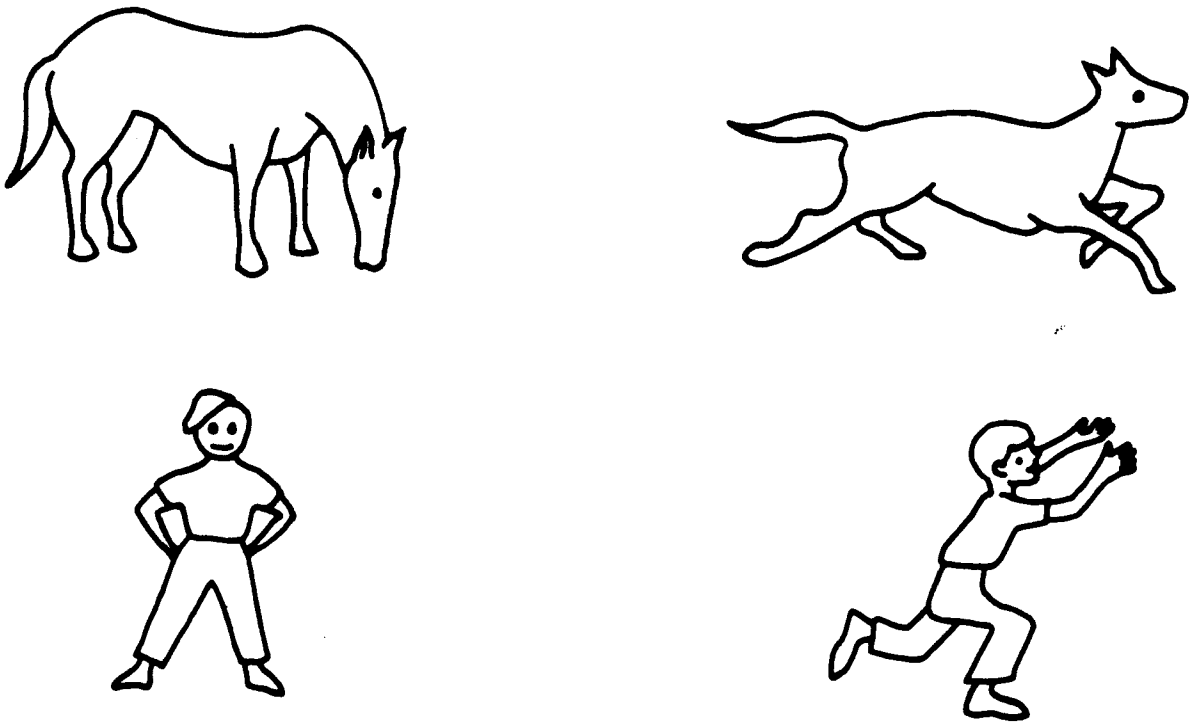

Figure 1. Examples of static and dynamic pictures (Wapner and Werner, 1957).

There is a substantial body of literature relating to children's learning that departs from this point. As Wolff and Levin (1972) pointed out, within both Piagetian and Soviet developmental psychology, the imaging process is inextricably linked to overt or covert motor activity. From the point of view of Piaget (Piaget, 1962; Piaget and Inhelder, 1967, 1971; Piaget, Inhelder and Szeminska, 1964), both perception and imagery have their origin in the motor imitative activity of the child.

> "Considered from the point of view of its origin, the image is a product of imitation. It is in fact, an internalized imitation, one that can be made without resort to external gestures, though it is at first associated with such gestures (Piaget and Inhelder, 1967, p. 40)."

Allen Paivio, has been the major American theorist concerned with imagery. He stated:

> "...imagery includes a motor component, derived from perceptual exploration and manipulation of objects, which permits information to be transformed and reorganized within the system (Paivio, 1975, p. 60)."

This notion has been a springboard for research concerned with both the developmental course of imagery production and the processes involved in the production of imagery by children. In an experiment by Wolff and Levine (1972), the role of motor activity in children's formation of dynamic mental imagery was investigated in two experiments using a paired-associate (PA) recognition task. Using common children's toys, four experimental conditions were set up. In the control condition, the children (Ss) were instructed to remember which two toys went together. In the imagery condition, the children were instructed to form a mental image of the toys in each pair "playing together." In the E-Manipulate condition, each pair of toys was made to interact in a preestablished manner by the experimenter (E). In the S-manipulate condition, the children were instructed to make each pair of toys play together by actually manipulating the toys. The results (Figure 2) indicate that overt interaction of stimulus and response

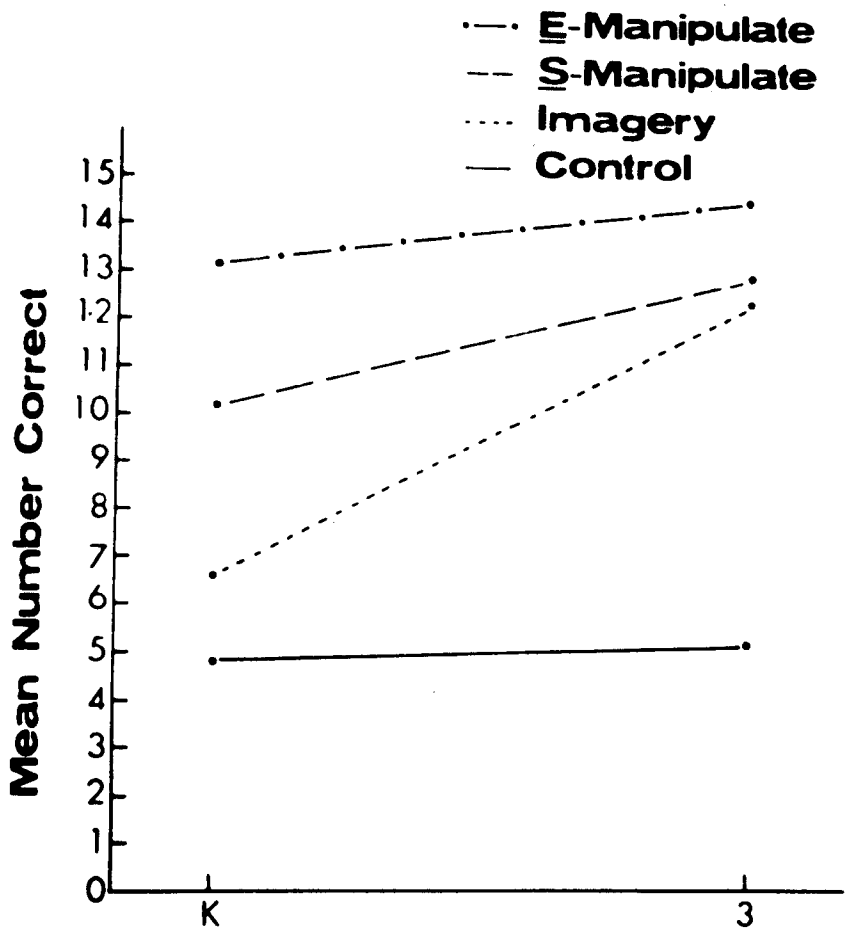

Figure 2. Mean number of correct responses (out of 16) by kindergarten and third-grade children in each of the four presentation conditions of Experiment I (Wolff and Levine, 1972).

items, initiated by E or S produced a marked facilitative effect on PA learning for both third grade and kindergarten children. As mentioned earlier, Piaget (1962) claimed that the production of mental imagery originates ontogenetically in the motor activity of the child. In the experiment described above, motoric production of interacting imagery was confounded by the children's ability to observe the consequence of their actions. The

results of the E-manipulate condition showed that visual input itself leads to marked facilitation. Therefore, Wolff and Levine (1972) provided a way in which their subjects could manipulate the toys without concurrent visual input by constructing a "house." This allowed the children to manipulate toys they could not see. The performance of children who engaged in overt but invisible activity was superior to that of children who did not move objects (Figure 3).

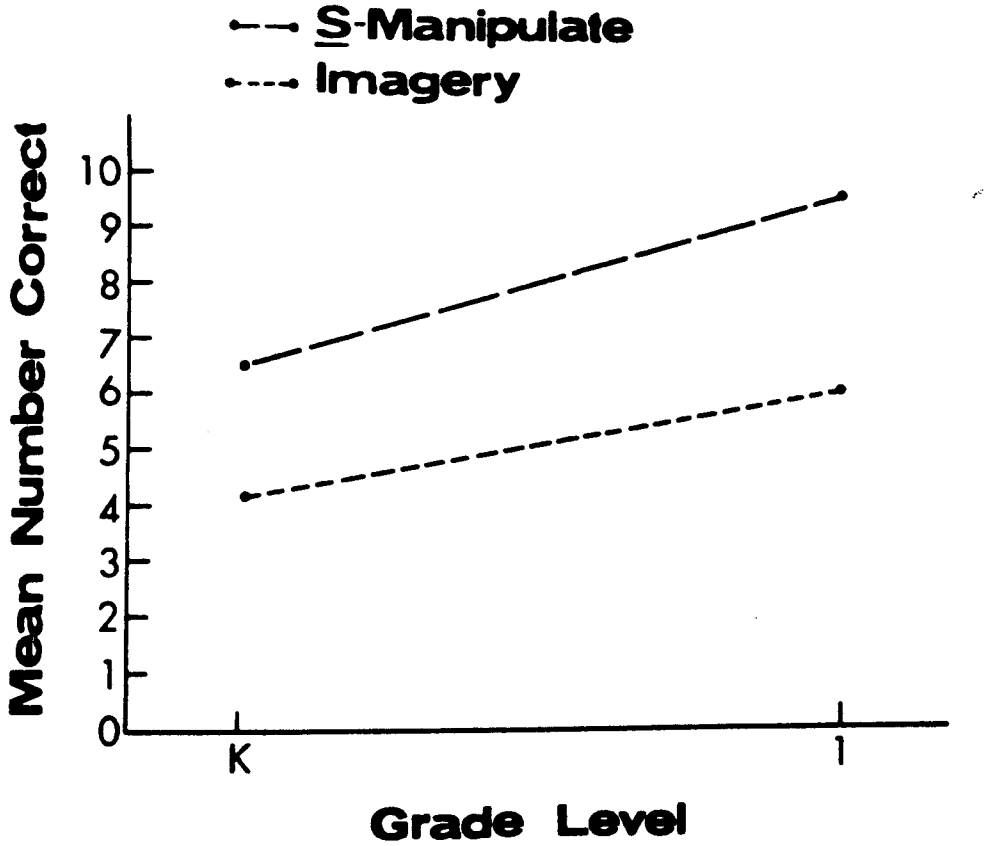

Figure 3. Mean number of correct responses (out of 12) in Imagery and "Invisible" Manipulate conditions for kindergarten and first grade children (Experiment II) (Wolff and Levine, 1972).

Other studies by this group (for example, Wolff, Levin and Longobardi, 1972, 1974) examined the effect of disrupting haptic and/or visual contact with the stimuli and found that effective activity was inhibited by lack of tactual contact but not by visual deprivation.

Bloom and Lahey (1978, p. 248) recently made the following observation:

> "It appears that semantic-syntactic knowledge of verbs influences comprehension and production similarly in early development. The semantics of verbs determines the selectional restrictions on nouns as subjects and objects, and the verbs that predominate in early grammar are the verbs that allow reference to people doing things and inanimate objects being acted on (p. 248)."

Action relations, they observed, are predominant in the content of early sentences, being encoded in sentences before children learn to encode states that do not involve action (Table 1).

Table 1. Rank order of most frequent verbs in transitive action and three locative action categories (data combined for all children) (Bloom and Lahey, 1977).

Action		Agent-Locative Action		Mover-Locative Action		Patient-Locative Action	
Verb	Frequency[a]	Verb	Frequency[b]	Verb	Frequency	Verb	Frequency
get	252	put	287	go	132	go	285
do	169	take	48	sit	95	fit	65
make	132	away	26	go bye-bye	28	sit	34
read	86	turn	10	come	25	fall	30
play	84	out	9	get	18	bye-bye	11
find	69	get	7	fall	15	stand	6
eat	60	fit	7	stand	11		
fix	59	do	6	climb	9		
draw	52	dump	6	jump	7		
hold	50	sit	5	move	6		
				away	5		

[a]Includes verbs with frequencies of 50.

[b]Includes verbs with frequencies of 5.

In general, then, these results highlight repeated observations with children that tend to support Paiget's contention that motoric activity plays a primary role in the production of dynamic imagery. But what about aphasic persons?

Issues related to manipulation probably remind you of Howard Gardner's (1973) study on "The contribution of operativity to naming capacity of aphasic patients." Gardner, too, took as a starting point Piaget's view that individuals construct their knowledge of the world by acting upon the objects in the world, by manipulating, ordering, and otherwise transforming them. Gardner's hypothesis was that objects which could be readily "operated upon" would be known through a variety of actions and sensory modalities. Accordingly, he tested the contribution that manipulability (in Piaget's terms, "operativity") made to naming. He found that matched groups of anterior and posterior aphasic subjects did not differ significantly in the number of types of items which they had difficulty naming on confrontation. In other words, naming deficits had little localizing value. But those items which were easiest for both groups to name were those whose names occurred most frequently in English and those which were

relatively operative; that is, those objects in the world which lend themselves to manipulation and transformation, and have appeal to multiple sensory modalities.

Gardner concluded that his data supported Piaget's hypotheses and stated that naming depends upon the capacity to arouse some subset of the actions or sensory experiences normally involved in activity with the object. He felt that the relative "robustness" of the names of operative elements can be aroused through several sensory modalities, while the names of figurative elements depend primarily on association with the visual modality.

From these experiments can we conclude perhaps that manipulability or operativity improves PA learning in children and naming in aphasic individuals? That action or operativity helps preserve lexical units? Why? Are they better or more extensively represented cortically? If the theory holds true for nouns, why shouldn't it be even more true for verbs; particularly verbs of actions that involve movement? I remind you of the observation of Boller and Green (1972), Geschwind (1975) and Johnson et al. (1977) that even the most severe Wernicke's or global aphasic subjects frequently retain a disproportionate ability to execute upon command whole body movements such as to stand, to turn, to sit even when comprehension of other types of commands seems nil.

One "hooker" in all my theorizing, however, relates to the issue of whether the right hemisphere can recognize verbs at all. Mind you, I am not claiming that I want the right hemisphere to carry the entire load in processing verbs, but I could hardly claim that action imagery facilitates visual imagery which in turn facilitates right hemisphere functioning if the right brain cannot recognize verbs. And that was the claim advanced in 1967 by Sperry and Gazzaniga. To give one example of the research their observation spawned, we could consider that which sprang from Gazzaniga's followup (1970) study which indicated that the right hemisphere of split-brain patients can process simple nouns ending in -er such as "butter" or "water" but is unable to process either verbs or verb-derived nouns such as "teller" or "trooper." The ups and downs of that theory are too numerous to recount here. Researchers such as Caplan, Holmes and Marshall (1974); Ellis and Shepherd (1974) and most recently, Wolff and Koff (1978) conclude that Gazzaniga's findings may be due to confounding factors other than the noun-verb distinction. The Wolff and Koff (1978) study, for example, concluded that when a word has unhindered access to both hemispheres the pure noun versus verb-derived character of the word does not affect processing difficulty.

I believe the most relevant research to our interests in the right brain of aphasic individuals comes from Zaidel (1976). Zaidel has studied two complete commissurotomized patients and three hemispherectomies (1 left, 2 right). What is unique about Zaidel's experiments is his development of a novel contact lens technique used to lateralize the visual display to one visual half field at a time, permitting free ocular scanning and manual manipulation of the stimulus as well as self-monitoring of his subjects' hand movements. Thus, unlike the milliseconds (usually less than 200) exposure times of previous visual half field experiments, Zaidel has been able to use exposure times long enough to allow him to administer a variety of standardized tests. Results relevant to my concern with verbs will be highlighted, as there is not sufficient time to adequately review the other.

Zaidel asks whether the right hemisphere is selectively deficient in decoding verbs and action names (e.g., drinking) as compared with proper names. Each of the 18 verbs and actions from the Peabody Picture Vocabulary Test (Dunn, 1965) was matched with a noun from that test for frequency and for age of acquisition as determined by the item number in the test. Mean left and right hemisphere scores on the two lists were then compared. The mean right hemisphere score was 67% correct for verbs and actions versus 68% correct on nouns. Therefore, the contention that the right hemisphere cannot comprehend action names or verbs as well as it can comprehend nouns was rejected. Zaidel's right hemisphere patients performed very much like the aphasic patients did in the Schuell, Jenkins and Landis (1961) study on auditory vocabulary. This observation plus others that I don't have time to discuss, led Zaidel (1976) to conclude:

> "...that language competence in the disconnected right hemisphere reflects the usual level of linguistic competence in the adult minor hemisphere rather than an abnormal state of cerebral dominance due to possible early brain damage" (p. 207).

So I do think it is a reasonable supposition that the right hemisphere can comprehend verbs and actions. But what of the effect of visual imagery? It should matter what kind of verbs are used and yet, as far as I know, no one has looked at this issue.

Considering these observations: that manipulability or operatively matters, that whole body commands are often preserved when all else is lost, and that the right hemisphere can comprehend verbs, has led me to believe that action imagery might get at right hemisphere processing. But which verbs should we choose if we follow the hypothesis that visual imagery will be increased if the verbs are "actionable?" It turns out that classifying verbs is a major theoretical problem and one for which there seem to be a multitude of classification approaches. An illustrative system is that proposed by George Miller (1972). Miller states:

> "Nothing is more common in our environment than the movement of people and things; in order to characterize the environment, a language must have a rich supply of words for indicating how an object that is in place P_1 at time T_1 comes to be at place P_2 at some subsequent time T_2 (p. 338)."

The words that serve this purpose most directly are the verbs of motion. There are many other verbs, he points out, that describe movement. There are contact verbs such as hits, strikes, knocks; bodily movements such as shrugs, breathes, coughs and so forth. He focuses on the verbs of motion which comprise a limited subset of the verbs of action and are characterized by the fact that they describe something traveling from one place to another. Of these, I would be particularly interested in using such verbs as carries, climbs, drops, flies, jogs, pulls, pushes, runs, walks, and so forth. I'm also interested in another class of verbs to use for comparison, perhaps the bodily movements such as sits, stands, smiles, swallows, and so forth. And perhaps a class that would include such actions as eats, drinks, chews, etc. What I'd like to add to Miller's selection criteria are variables such as the bilaterality of the movement, its position on the body, its age of acquisition, and the like. But let me show you how complicated the issue becomes by showing you Miller's criteria (Table 2). These are the criteria he's decided are important to be considered when looking just at verbs of

motion	travels, changes location, comes/goes
reflexive-objective	reflexive pronoun—direct object
causative	causes to, makes
permissive	allows to, lets
propellent	applies force to
directional	directional preposition
medium	on land, through the air, water
instrumental	by foot, by boat, etc.
inchoative	adjective
change-of-motion	begins, finishes
deictic	toward or away from speaker
velocity	slowly, rapidly

motion. His chapter, not to mention his book (1976), details this system at some length and complexity. My point here is that I think specification of the semantic features of the verbs we choose to study is very important. It is quite possible to speculate that an aphasic individual may be unable to retrieve one or more features for use in discriminating such verbs. The next figure (Figure 5) shows Miller's system and its complexity more graphically. I believe that in order to adequately classify and handle verbs, we are going to have to look seriously at the semantic features these verbs possess. This we are now beginning to do; we plan to spend the summer exploring the matter more thoroughly.

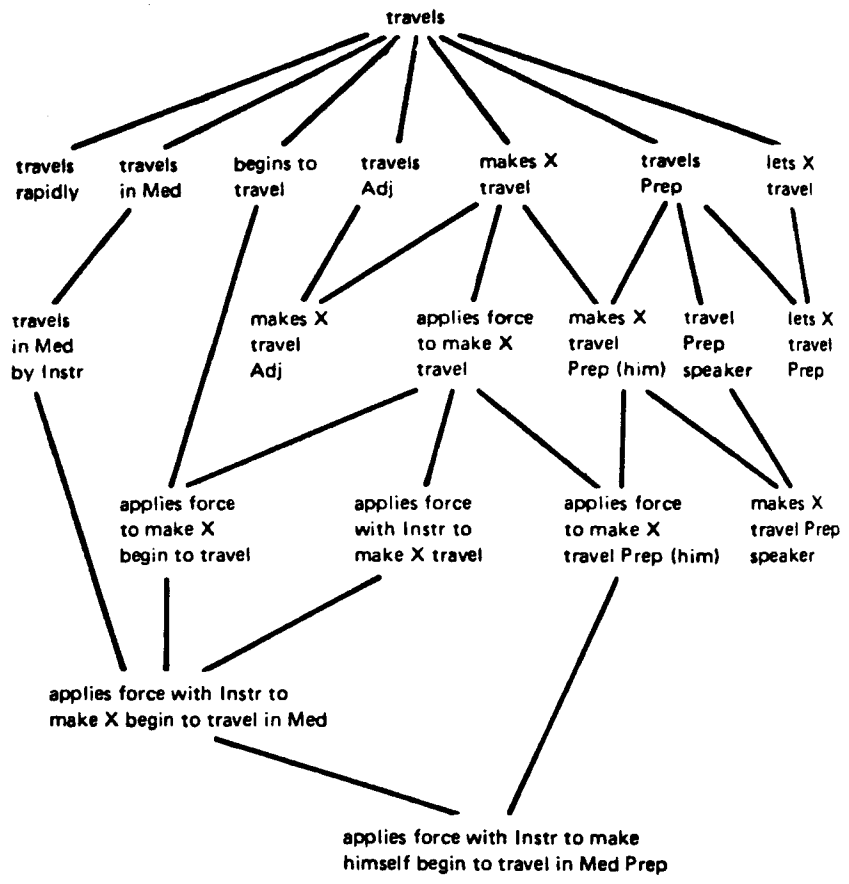

Figure 5. Relations among paraphrase combinations proposed as incomplet definitions in English motion verbs. If two definitions are connected b a line, the one below includes all the semantic components of the one above, plus others. (Miller, 1972).

To quote from my own abstract, "It is [was] the intent of this presentation that the audience will be able to walk away with a clearer notion as to how they might go about manipulating the variables that influence comprehension and/or production of verbs or action imagery." Sorry to say that's not true. All I can hope is that by highlighting some of the issues you will be convinced again of the complexity of language and its dissolution. Miller (1972) said that what we remember is not the particular words that we use to code our experiences, but the concepts underlying those words. To tap those in the aphasic patient should be our goal.

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