Assessment of Oral Apraxia in Brain-Injured Adults

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There are numerous tests which are designed to assess oral apraxia in brain-injured adults. These tests range from informal observation to elaborate batteries. Certain of these tests display limitations in design which reduce their usefulness to the clinical aphasiologist. The purpose of this presentation is to describe an oral, nonverbal gesture test battery, to demonstrate its administration and interpretation, and to discuss its clinical application.

The Oral, Nonverbal Gesture Battery is composed of fourteen stimuli presented under four stimulus conditions with two response modes. Behaviors are assessed with two evaluation systems. Fourteen stimulus items (Table 1) were selected from existing test batteries. Each stimulus item represents a discrete oral gesture. Each stimulus is picturable; that is, capable of being photographed. The stimuli are presented under four stimulus conditions (Table 2). The first stimulus condition is visual-photograph. The second is verbal command. The third stimulus condition is demonstration or imitation. The last stimulus condition is visual written.

There are two response modes for each stimulus item. The subject is requested either to match corresponding stimuli or to produce a target oral gesture. Behaviors elicited by the stimuli are evaluated in two manners. The behavior is first noted as correct or incorrect. The behavior is then assessed with a category evaluation system (Table 3). The category evaluation system, adapted from a scale designed by Kerschensteiner and Poeck (1973), is sensitive to fifteen types of error behavior. The first four error behaviors, designated by the letter "S," are substitution of the target oral gesture by another oral gesture, body gesture, noise, or talking. For example, a patient, responding to the stimulus "Show me how you cough," might produce "Cough--Cough." This is verbal substitution. The next group of error behaviors, designated by the letter "A," are augmentation of the target oral gesture by additional oral movement, body movement, or noise. For example, a patient, in response to the stimulus "Stick out your tongue," might use his hand to pull out his tongue. This is body augmentation. The other error categories are no response, fragmentation, distortion, delay, self-correction, groping, perseveration, and unintelligible. It might be noted that an incorrect response may be characterized by one or many types of error behavior.

To summarize, the Oral, Nonverbal Gesture Battery is comprised of eight subtests. Subtests PW, PP, PA, and PD assess the subject's ability to produce oral gestures (Table 4). Subtests MW, MP, MA, and MD assess the subject's ability to match corresponding stimuli representing oral gestures.

TABLE 1
ORAL, NONVERBAL GESTURE BATTERY
STIMULI

1. SHOW ME HOW YOU STICK OUT YOUR TONGUE.
2. SHOW ME YOUR TEETH.
3. SHOW ME HOW YOU SMILE.
4. SHOW ME HOW YOU PUCKER YOUR LIPS.
5. SHOW ME HOW YOU COUGH.
6. SHOW ME HOW YOU PUFF YOUR CHEEKS.
7. SHOW ME HOW YOU TOUCH YOUR NOSE WITH YOUR TONGUE.
8. SHOW ME HOW YOU TOUCH YOUR CHIN WITH YOUR TONGUE.
9. SHOW ME HOW YOU TOUCH THE CORNER OF YOUR MOUTH WITH YOUR TONGUE.
10. SHOW ME HOW YOU BLOW.
11. SHOW ME HOW YOU SUCK.
12. SHOW ME HOW YOU OPEN YOUR MOUTH.
13. SHOW ME HOW YOU BITE YOUR LIP.
14. SHOW ME HOW YOU BITE YOUR TONGUE.

TABLE 2

ORAL, NONVERBAL GESTURE BATTERY

STIMULUS MODES

1. VISUAL - PHOTOGRAPH

2. AUDITORY

3. DEMONSTRATION

4. VISUAL - WRITTEN

TABLE 3
ORAL, NONVERBAL GESTURE BATTERY
EVALUATION SYSTEM

Ss – SEMANTIC SUBSTITUTION

Sv – VERBAL SUBSTITUTION

Sb – BODY SUBSTITUTION

Sn – NOISE SUBSTITUTION

Ao – ORAL AUGMENTATION

Ab – BODY AUGMENTATION

An – NOISE AUGMENTATION

Ø – NO RESPONSE

F – FRAGMENTATION

D – DISTORTION

DE – DELAY

SC – SELF-CORRECTION

G – GROPING

P – PERSEVERATION

C – CORRECT

U – UNINTELLIGIBLE

TABLE 4
ORAL, NONVERBAL GESTURE BATTERY
SUBTESTS

SUBTEST	ORDER	DESCRIPTION
PW	1	PRODUCTION OF ORAL GESTURE BY WRITTEN STIMULUS
PP	2	PRODUCTION OF ORAL GESTURE BY PHOTOGRAPH
PA	3	PRODUCTION OF ORAL GESTURE BY AUDITORY COMMAND
PD	4	PRODUCTION OF ORAL GESTURE BY DEMONSTRATION
MW	5	MATCHING WRITTEN STIMULUS TO PHOTOGRAPH
MP	6	MATCHING PHOTOGRAPH TO PHOTOGRAPH
MA	7	MATCHING AUDITORY COMMAND TO PHOTOGRAPH
MD	8	MATCHING DEMONSTRATION TO PHOTOGRAPH

(A videotape of an administration of the Oral, Nonverbal Gesture Battery was then presented. Included were exerpts from the four production subtests. The first segment was Subtest PA, production of an oral gesture by verbal command. The second segment was Subtest PD, production by demonstration. The third segment was Subtest PW, production by written stimulus. The fourth segment was Subtest PP, production by photograph.)

In this videotape, many error responses were observed. One of these responses was then analyzed as to the type of error behavior. The response was comprised of eight error behaviors (Table 5). The subject first moved his tongue and jaw after stimulus delivery. He then dropped his jaw and protruded his tongue. The third behavior was a lateral movement of the tongue. The fourth was a central tongue movement. The fifth behavior was elevation of the tongue to the central incisors. The sixth behavior was a lateral movement of the tongue to the corner of the mouth. The seventh behavior was tongue movement to the midline of the lips. These seven discrete movements, in addition, are all classified as groping behavior.

I shall now describe how the Oral, Nonverbal Gesture Battery has been used to make numerous observations concerning the oral praxis skills in four representative adults. Table 6 provides descriptive information for these adults. Subject N had no history of neurologic disease. Subject R had right-hemisphere brain injury. Subject AOS exhibited aphasia with apraxia of speech. Subject A exhibited aphasia only.

Figure 1 provides measures gained from the normal and the right-hemisphere brain-injured individuals. The normal subject scored no less than twelve correct for each of the eight subtests. His overall score was 106 of 112 correct. His performance was relatively consistent across all eight subtests. The right-hemisphere brain-injured subject performed less well, with 92 of 112 correct. Performance also appears to be less consistent across the four production subtests than the performance of the normal subject. Production of oral gestures to photographs and to demonstration was less intact than production to verbal command or written stimulus. The overall score for the subject exhibiting aphasia was 77 correct (Figure 2). The overall score for the subject exhibiting aphasia with apraxia of speech was 46 correct. Performance levels for both subjects display great variability by stimulus condition. Production of an oral gesture by written stimulus was the least intact. Production of an oral gesture by demonstration was the most intact. It might be noted that both subjects displayed improvement between Subtests PA, production by verbal command, and PD, production by demonstration.

Figure 3 provides information about differences between matching and production scores for the three groups of subjects across subtests. In general, it appeared to be easier for all three brain-injured subjects to match oral gestures than to produce them. There was a large gap between matching and production for Subject AOS. The gap was less prominent for Subject A.

Figure 4 presents the distribution of error responses across the fifteen possible types of error behaviors. (Incorrect responses may be characterized by one or many error behaviors.) The subject with apraxia of speech made fourteen types of errors. The subject with aphasia made ten types of errors. Both subjects displayed a relatively wide range of error behavior.

Figure 5 suggests that the most frequent error behaviors observed for Subject AOS were semantic substitution, noise augmentation, groping, verbal substitution, and fragmentation. These five error behaviors accounted for

TABLE 5

ONVGB

SCORING ERROR BEHAVIOR - EXAMPLE C

STIMULUS	BEHAVIOR
C1. SHOW ME HOW YOU	F/Ss/Ss/F/Ss/Ss/F-G
PUFF YOUR CHEEKS.	

TABLE 6
ONVGB
SUBJECT DESCRIPTION

SUBJECT	AGE	EDUC	LESION	WPO	PICA OVAL	PICA GEST.	PICA VERB.	PICA GRAPH	TOKEN TEST
N	49	14	—	—	14.64	14.83	14.58	14.43	57
R	60	10	R-CVA	4	13.64	14.69	13.65	12.25	51
AOS	59	16	L-CVA	27	8.54	12.12	3.75	6.97	14
A	49	12	L-CVA	157	10.68	12.51	11.25	7.72	17

FIGURE 1
ONVGB
PERFORMANCE LEVELS
NORMAL AND RIGHT-HEMISPHERE BRAIN-INJURED SUBJECTS

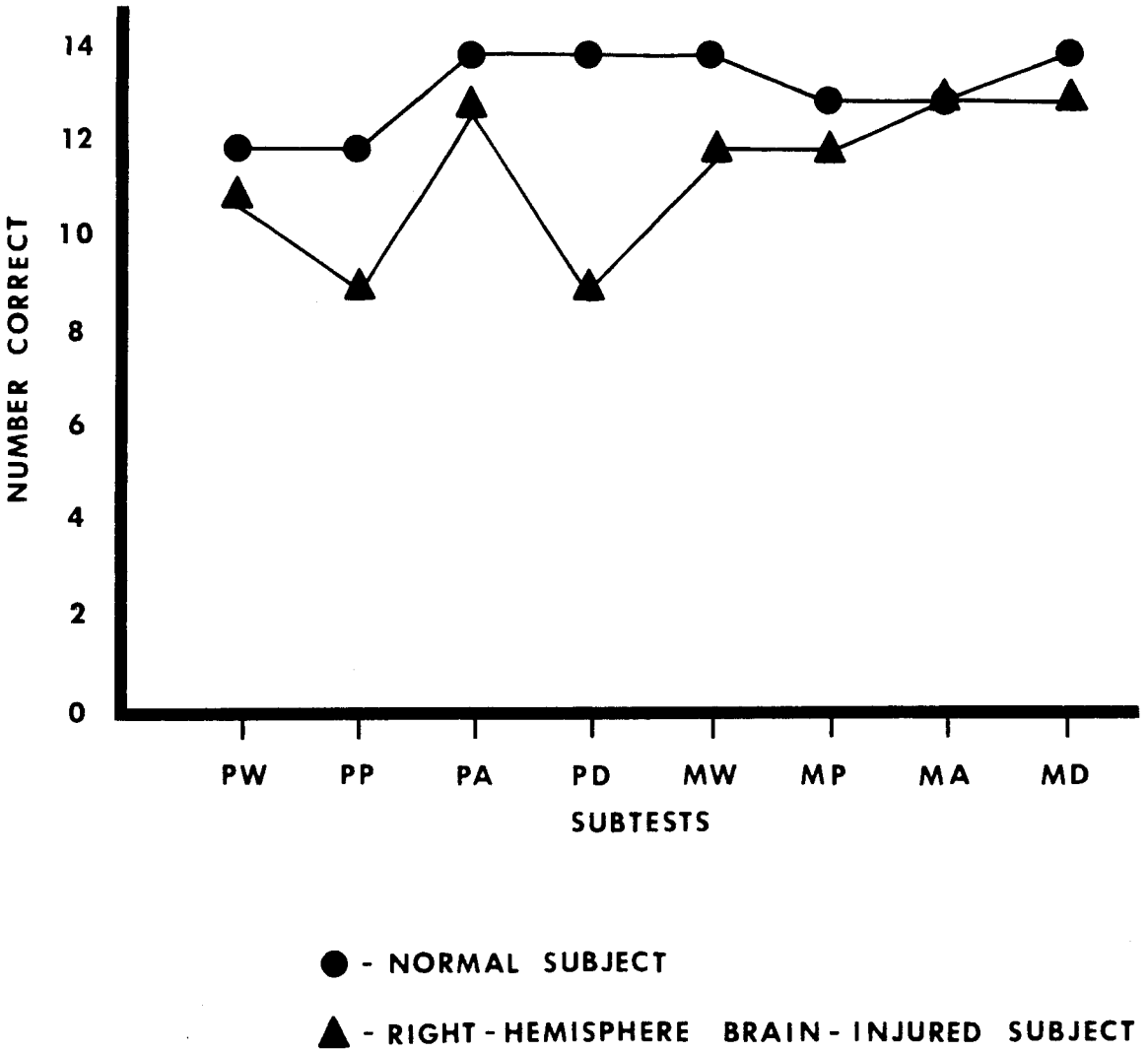

FIGURE 2
ONVGB
PERFORMANCE LEVELS
LEFT - HEMISPHERE BRAIN-INJURED SUBJECTS

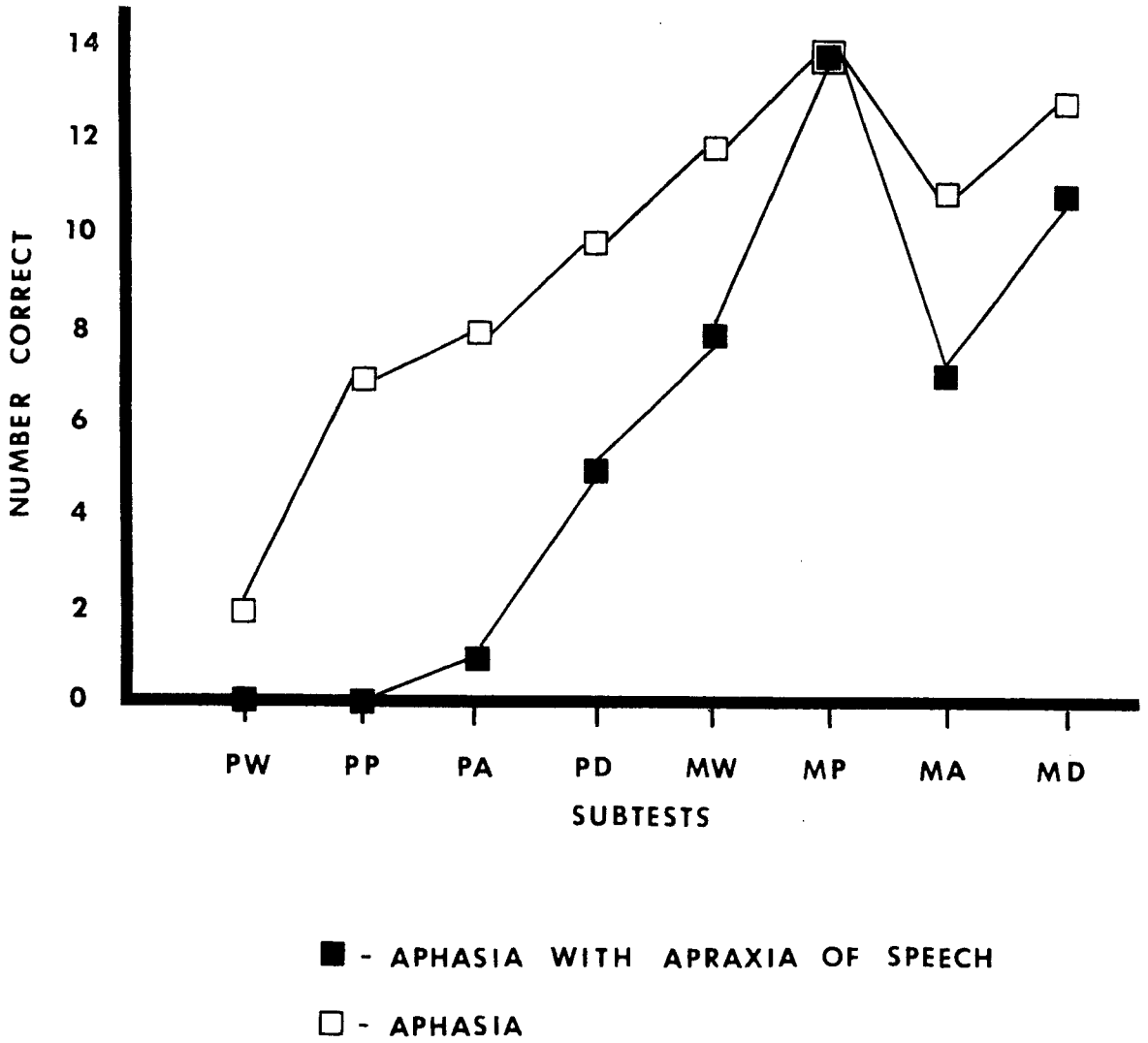

FIGURE 3

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CONTRAST BETWEEN MATCHING AND PRODUCTION PERFORMANCE LEVELS

THREE BRAIN-INJURED SUBJECTS

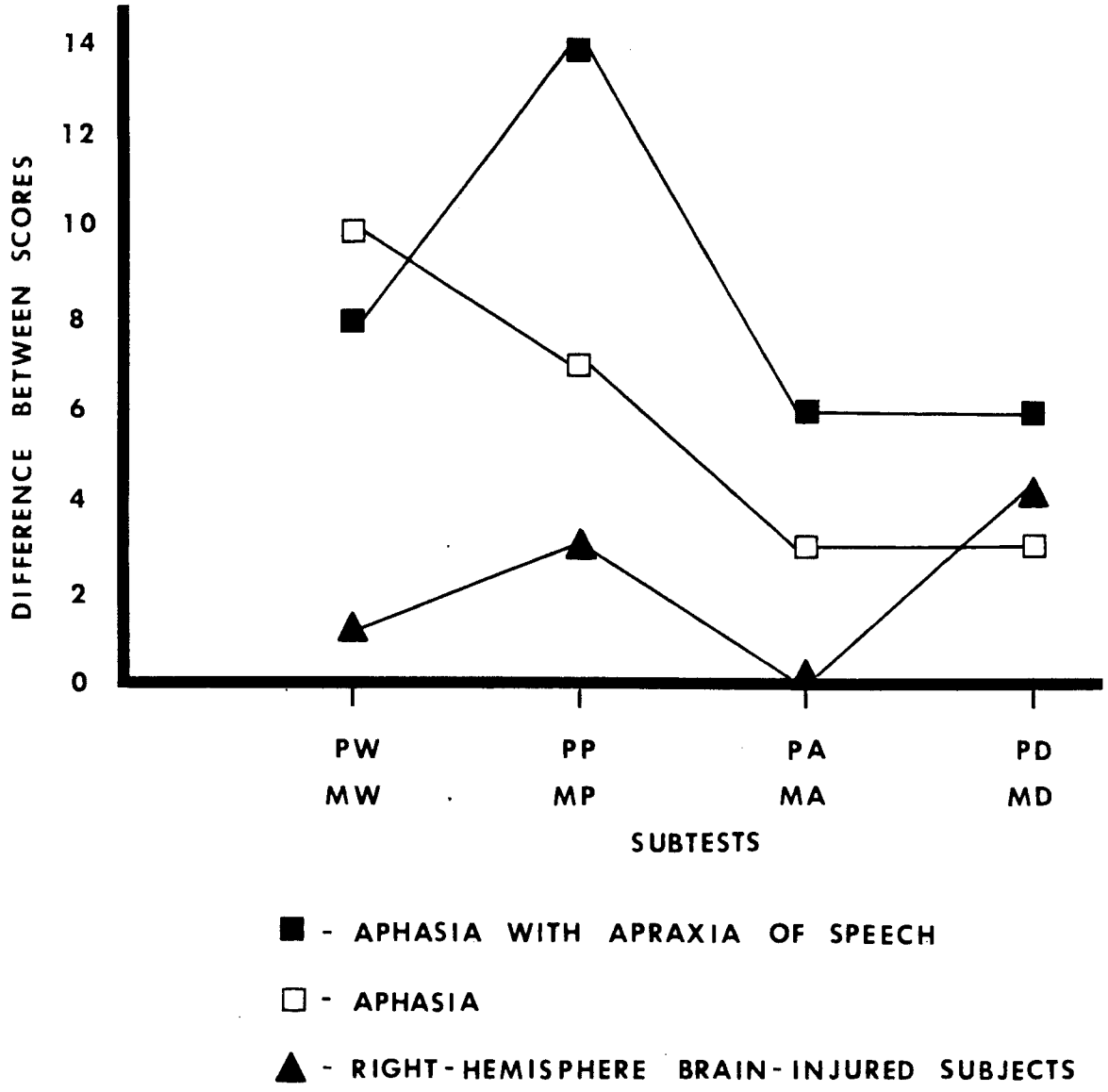


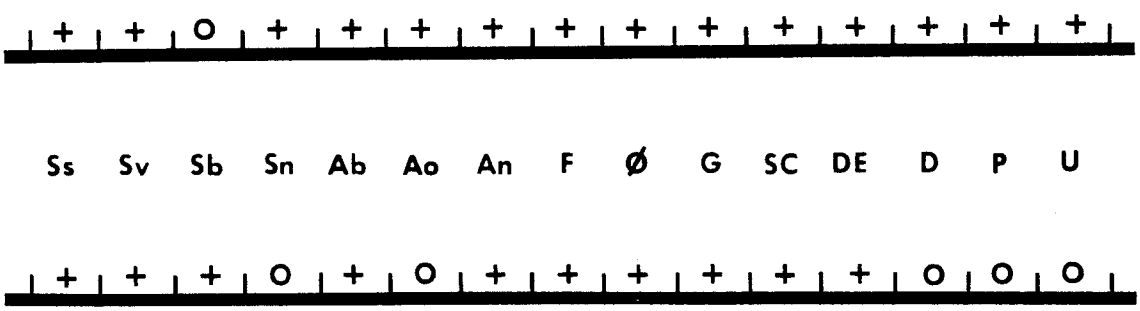
FIGURE 4

ONVGB

DISTRIBUTION OF ERROR BEHAVIOR

TWO LEFT - HEMISPHERE BRAIN - INJURED ADULTS

APHASIA WITH APRAXIA OF SPEECH



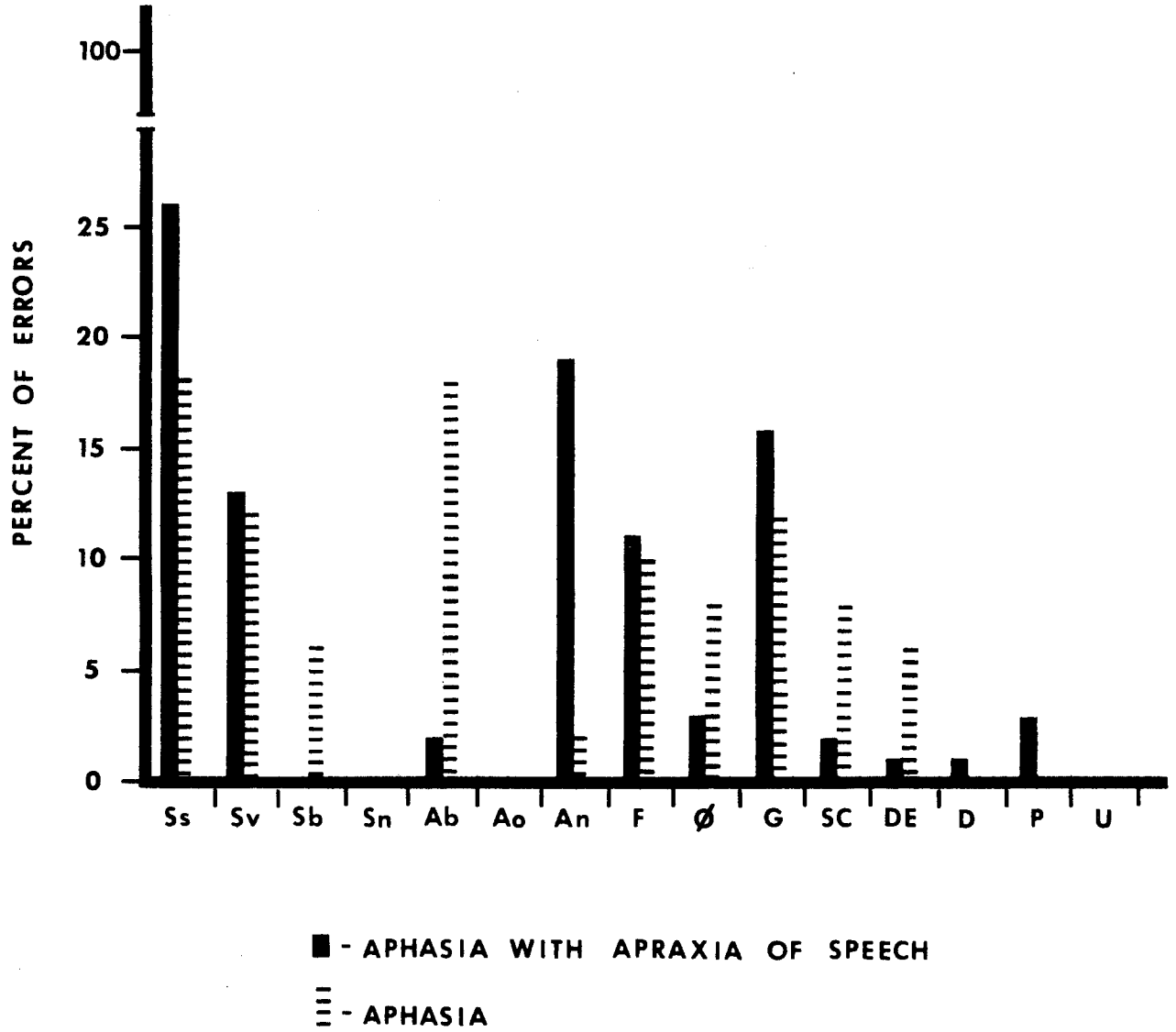
APHASIA

FIGURE 5

ONVGB

RELATIVE DISTRIBUTION OF ERROR BEHAVIOR

TWO LEFT-HEMISPHERE BRAIN-INJURED SUBJECTS



more than 85% of his total. The most frequent error behaviors observed for Subject A were semantic substitution, body augmentation, groping, verbal substitution, and fragmentation. These accounted for 70% of the total number of behaviors. As noted, there is considerable overlap in the major types of error behavior exhibited by the two left-hemisphere brain-injured adults.

In summary, the Oral, Nonverbal Gesture Battery allows the clinical aphasiologist to determine each patient's level of competency in matching and producing oral gestures. It allows the aphasiologist to operationally define this level of competency by stimulus condition, mode of response, and type of error behavior. This information may prove of benefit in exploring mechanisms underlying disturbances of oral praxis. It may also have usefulness in planning strategies to ameliorate oral praxis disturbances.

References

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Kerschensteiner, M. and K. Poeck. "Bewegungsanalyse bie buccofacia ler apraxie," Nervenarzt, 45 (1973), 9-15.

Luria, A. Higher Cortical Functions in Man. New York: Basic Books, 1966.

Poeck, K. and M. Kerschensteiner. "Analysis of sequential motor events in oral apraxia." Paper presented to the Academy of Aphasia, Albuquerque, New Mexico, 1973.

Discussion

Q: Was it your intent to restrict the scope of the test battery to matching and production tasks only?

A: Yes.

Q: Did you consider assessing reflexive oral motor activities with real objects?

A: Yes; but they were not included in the test battery because of difficulties in control and implementation.

Q: Do you think that kind of information is important in a battery assessing oral apraxia?

A: Yes. Goldstein (1948) and Luria (1966) observed that abstractness of a gesture had a great influence on its intactness. A gesture that was used in an "automatic" sense might be intact whereas that same gesture, in a confrontation setting, might be greatly disturbed.

Q: How long does it take to administer and score the oral apraxia battery?

A: The battery takes approximately forty minutes to administer and forty minutes to score after twenty hours of training.

Q: Would you elaborate on the matching tasks in the test?

A: The matching tests were designed to assess a patient's ability to recognize and compare oral gestures. The four matching tasks were photograph to referent photograph, verbal command to photograph, written stimulus to photograph, and demonstration to photograph. For example, the patient was requested to match the verbal command "Stick out your tongue" to a photograph depicting that same oral gesture.

Q: When will the test be ready for use?

A: The test will be ready for clinical use in approximately five months.

Q: Are there overlaps which might be eliminated to reduce the length of the battery?

A: I'm not sure. I am assessing that now.

Q: Is there any pay-off in the tasks employing written commands?

A: I think so. Most of the existing tests assessing oral apraxia employ two stimulus conditions--verbal command and imitation. I feel that we are missing much information by ignoring the remaining input modalities. I believe that the literature supports this point of view.

Q: Can you predict long-term recovery of oral praxis skills and speech articulation skills with the test battery?

A: I have not investigated these aspects.

Q: Does the evaluation category "semantic substitution" reflect a theoretical predisposition as to what might be underlying a particular error behavior?

A: That category was selected from a scale designed by Kerschensteiner and Poeck (1973). These authors first observed and then classified error behaviors in a large population of brain-injured subjects exhibiting oral apraxia. I am not sure whether the term "semantic substitution" represents a theoretical point of view or not.

Q: Have you considered assessing sequential oral movement?

A: Yes. All the gestures employed in the present test are isolated oral movements because of limitations in test design.