

A Modified Scoring Technique for Communicative
Abilities in Daily Living

Cynthia L. Bartlett
University of Pittsburgh, Pittsburgh, Pennsylvania

I would like to discuss a modified scoring technique for Communicative Abilities in Daily Living--CADL (Holland, 1980). The modification and how it was derived will be described first. Then some data will be presented on the two measures' validity and reliability and how they relate to the communication of aphasic patients. Last, treatment implications will be discussed.

DESCRIPTION

CADL is a valid test that quantifies the extent of functional communication remaining after brain damage. But its scoring system does not take into account how a given level of functional communication was achieved. Was it spoken, written, gestured? If it was oral, did the speaker make the point economically or was the effort full of struggle, circumlocution, and nonspecific referents? To be credited as functional, CADL's scoring rules allow the use of any communication channel and the rules do not differentiate between responses which are succinct and those which ramble--as long as the point is made, the response is functional and is scored as such. For clinicians who are interested in keeping track of features such as modality used and the overall parsimony of a response, the CADL manual urges testers to take notes on the form of communication and to incorporate these qualitative features into treatment plans where possible.

The purpose of the present study, which is part of a small series of related studies, is to develop some scoring guidelines for rendering these scoring notes more systematic. It is the intent of the work to develop tested guidelines for this qualitative scoring of CADL responses to use in addition to the standard quantitative functional score. Two dimensions which characterize normal communicative interactions are suggested: orality and efficiency of responding.

In addition to being functional, the natural form of normal communication is oral. It is also efficient. While we can communicate graphically and gesturally, the "first line," so to speak, is the oral channel. The more a patient uses speech instead of alternate modalities to relay messages, the more normal the communication. Two individuals with perfect CADL scores, for instance, could have achieved that score in entirely different ways: one could have earned the score by speaking responses, the other solely by gesture and writing. The assertion here is that the former--the spoken message--is more normal and to the extent that aphasic patients can approach maximal use of speech to respond (regardless of correctness, functionality, or efficiency) the more normal the communication is--at least in terms of channel.

Efficiency--what is efficient communication? We all think we know it when we hear it, but measuring it is another matter. Yorkston and Beukelman (1980) pointed out that when units of content per minute are counted, being able to predict content is necessary for measuring efficiency.

Berko-Gleason et al. (1980) suggested the same thing when they counted the number of target lexemes that their subjects produced in response to standard stimuli of highly predictable content. CADL responses, which are predictable to a degree, also approach conversation. It is conversational in style. It is somewhat conversational as well in the sense that the content of responses to it are less predictable and standard than are responses to the "Cookie Theft" picture, for example. Yet when one hears the verbose, empty, circumlocutory, sometimes jargon-littered CADL responses of a Wernicke aphasic patient, one would not hesitate to label him inefficient. If that person subsequently learns to control the nature of his or her output and produces more specific responses, a careful observer would probably be aware of the improvement regardless of the fact that content was not highly predictable. Operational definitions and scoring guidelines are in order.

It was felt initially that scoring for orality should be a fairly straightforward matter. Any given utterance either is or is not oral. However, as with most things, it was not quite all that simple and the scoring rules in Appendix A are the result of the ensuing refinements. They serve in addition as an operational definition of the quality of orality.

Defining efficiency was a rather more thorny matter. Briefly, the responses to CADL of 130 normal-speaking subjects in the test's norming sample were read. Detailed notes were taken and judgments were made regarding the efficiency of the responses. The common elements were distilled into the efficiency scoring rules in Appendix B. Appendix C illustrates scoring combinations. There remained, in addition, a number of item-specific criteria for evaluating efficiency. These are detailed on a CADL score booklet which has been modified to accommodate this scoring system (available upon request from the author).

For the purposes of the preliminary excursions into this task, a plus-minus scoring system was selected as a way to describe the quality of a responses's oralness and the quality of a response's efficiency.

Finally, not all CADL items can be scored for orality. The most obvious example is the item in which a person is asked to fill in a form. In all, there are 16 CADL items in which the nature of the task tends to limit the response to a non-oral channel or to which normal subjects responded orally less than 10% of the time. The stimuli which are scored for orality and efficiency, then, are the subset of 52 CADL items which do not demand a non-oral response and to which normal speakers respond orally 90% or more of the time.

In summary, two communication measures--orality and efficiency--have been added to an existing functional measure. Their purpose is to make possible a judgment of how closely aphasic patients' responses to CADL items resemble normal speakers' responses in these aspects. Responses to be evaluated for orality and efficiency are evoked in the course of administering the 68-item CADL test. The two new measures are given plus-minus scores on a selected subset of 52 items.

VALIDITY AND RELIABILITY

Construct/concurrent validation was approached by correlating the orality scores and the efficiency scores with CADL scores for 122 aphasic

subjects. Table 1 shows significant positive correlations for both institutionalized and non-institutionalized aphasic subjects. The magnitude of the correlations varies considerably and, while the correlations are significant, it should be reiterated that CADL and its two new scoring systems represent two different types of scoring; the former is quantitative, the latter qualitative.

Table 1. Pearson correlation coefficients between CADL scores and orality (O) and efficiency (E) measures.

| | Aphasic Inst. | | Aphasic Non-Inst. | |
|------|------------------|-------|----------------------|-------|
| | O | E | O | E |
| CADL | 0.48* | 0.96* | 0.61* | 0.95* |
| *p | 0.001 | 0.000 | 0.000 | 0.000 |

Table 2 shows the intra- and interrater reliability achieved for the two new measures. Ninety percent agreement had initially been set as the goal for both intra- and interrater agreements, but the relationship ended up being much stronger.

Table 2. Reliability (percent agreement) of orality and efficiency scores.

| I. Intra-Rater | % | Range |
|-----------------|-------|-----------------------|
| | | (# agreed upon items) |
| A. CADL | 99.0 | 66 - 68 |
| B. Orality | 100.0 | |
| C. Efficiency | 98.4 | 49 - 52 |
| II. Inter-Rater | | |
| A. Orality | 95.5 | 25 - 52 |
| B. Efficiency | 95.5 | 45 - 52 |

Besides exploring validity and reliability, an attempt was made to see if the two new measures reflect differences in orality and efficiency for two aphasic types in which one might predict that differences would lie in a certain direction. Specifically, the CADLs from 17 subjects with Wernicke-type and 41 subjects with Broca-type aphasia were scored. It might be predicted that the patients with Wernicke-type aphasia would turn out to be more oral than those with Broca aphasia. Table 3 shows results that confirm this prediction.

Table 3. Orality score difference between Wernicke's and Broca's aphasic subjects.

| | N | Mean | Std. Dev. | t |
|----------|----|------|-----------|-------|
| Wernicke | 17 | 46.8 | 5.8 | 4.15* |
| Broca | 41 | 36.5 | 13.9 | |

*p = $\leq .0005$

For the efficiency dimension, it might have been predicted that the people with Broca-type aphasia would score higher than those with Wernicke-type. Table 4 confirms the notion.

Table 4. Efficiency score difference between Wernicke's and Broca's aphasic subjects.

| | N | Mean | Std. Dev. | t |
|----------|----|------|-----------|--------|
| Wernicke | 17 | 32.8 | 9.2 | -2.00* |
| Broca | 41 | 38.2 | 10.9 | |

*p = .05

It seems that the measures are sensitive to distinguishing features of two aphasic syndromes, but what about change over time? The CADLS of five people with fluent aphasia and five with nonfluent aphasia were scored at one or two months and at 12 months post-onset. Table 5 shows that the patients with fluent aphasia did not change much in orality during the first year. Their output did, however, become significantly more efficient during this period.

Table 5. Changes over time in orality and efficiency for fluent aphasic subjects.

| | N | Mean | Std. Dev. | t |
|------------|---|------|-----------|-----------|
| ORALITY | | | | |
| 1 - 2 mpo | 5 | 48.8 | 5.63 | -1.2 (ns) |
| 12 mpo | 5 | 51.8 | 0.45 | |
| EFFICIENCY | | | | |
| 1 - 2 mpo | 5 | 32.6 | 13.39 | -2.6* |
| 12 mpo | 5 | 48.8 | 3.60 | |

*p = $< .05$

Among the group of nonfluent subjects, the reverse occurred (Table 6). These subjects became significantly more oral over time while their efficiency rate did not change much. All subjects were in therapy during some part of the year they were followed, but it was not possible to control for frequency or type of treatment.

Table 6. Changes over time in orality and efficiency for nonfluent aphasic subjects.

| ORALITY | | | | |
|------------|---|------|-----------|------------|
| | N | Mean | Std. Dev. | t |
| 1 - 2 mpo | 5 | 25.2 | 12.87 | -2.20* |
| 12 mpo | 5 | 42.2 | 11.58 | |
| *p = < .05 | | | | |
| EFFICIENCY | | | | |
| | N | Mean | Std. Dev. | t |
| 1 - 2 mpo | 5 | 29.6 | 10.09 | -1.64 (ns) |
| 12 mpo | 5 | 40.4 | 10.74 | |

The figures in Tables 5 and 6 suggest that orality and efficiency seem to change independently of each other. This would underscore the separateness of the two concepts.

APPLICATION TO TREATMENT

Orality and efficiency represent therapy goals. For example, there are patients who seem unwilling to try to use speech unless they feel sure that their attempt will be successful. Such patients' orality scores would probably be as low as their efficiency scores would be when there were items they refused to answer. Treatment goals might include helping such people to increase output and to take more communicative chances in hopes of getting a listener at least in the ballpark. Regardless of the method used--deblocking, asking a listener for assistance, self-cueing, use of associated words--the goal is increased orality. The orality scoring system will be sensitive to these treatment effects.

Similarly, for patients whose aphasia leaves them rambling emptily, treatment goals often include helping these people to decrease nonspecific referents, to improve their self-monitoring, to request their listener to signal when the aphasic speaker strays from a point, etc. The efficiency scoring system will document improvement on these goals.

The rationale and method for the addition of two qualitative scoring systems to supplement the quantitative scoring of Communicative Abilities in Daily Living have been outlined. Preliminary results suggest that the measures are sensitive to distinguishing features of two aphasia types and that people with fluent and those with nonfluent aphasia show characteristic

changes in orality and efficiency over time. Other studies with these two measures are in progress, but initial impressions suggest that the addition of orality and efficiency scoring to CADL's functional scoring may be useful clinically.

REFERENCES

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APPENDIX A

Orality Scoring Criteria

- 0 = Not Oral
1 = Oral

All of the designated subset of 52 CADL items may be scored for Orality. This dimension is given credit if any part of a response is oral without respect to correctness, pertinence, or quality.

- I. "0" scores for Orality are entered for:
- A. Non-phonemic sounds which do not traditionally carry meaning in the various dialects of American English speech.
Examples: moaning, grunting, unintelligible responses
 - B. An oral request for repetition followed by a non-oral response.
Example: Examiner: How old are you?
Patient: "Hmmm?"
Examiner: How old are you?
Patient: (Writes 46)
 - C. No response.
 - D. Written response.
 - E. Gestured response.
- II. Scores of "1" for Orality are awarded as described in the first paragraph above and include:
- A. Unintelligible segments of an otherwise intelligible response (even if the intelligible portion consists of jargon).
 - B. Perseveration.
 - C. Laughter, whistles, onomatopaea (siren, hissing, "boom"), "Harrumph," and the like.
 - D. Instances where the response to two items is given (orally) at the same time as on items 6 and 7. Both items are given Orality credit. When the response to two items is given but one is given orally, the other either graphically or gesturally, the appropriate Orality score is entered (either 0 or 1) for each question.

N.B. In scoring for Orality, the following distinction is made. "Unintelligible" suggests that an utterance carries no meaning and cannot be imitated by the examiner or transcribed. "Jargon," on the other hand, while also carrying no meaning is intelligible (it can be imitated by another person and is readily transcribed into standard orthography or into IPA notation) in both neologistic and extended English jargon forms.

APPENDIX B

Efficiency Scoring Criteria

0 = Non Efficient

1 = Efficient

- I. "0" scores for Efficiency are entered for responses where:
- A. The CADL score is "0"
 - B. There is elaboration beyond the limits defined for each item (see booklet)
 - C. The CADL score is "1" and
 - 1. is achieved by gesture or writing alone
 - 2. is achieved on the CADL "no response repeat" rule
 - 3. is accompanied by "I can't," "I don't know," and the like
 - 4. contains a discrepancy between the spoken and gestured or written response
 - 5. is achieved orally but does not directly address the task, such as on item 11: "Well, I don't have an appointment at all. I just go right in to the doctor."
 - D. Iteratives (two or more in a row) such as "Can sit down, can sit down, can sit down." These are to be distinguished from such multiple productions as "Hey, hey, hey" or "No, no, no" where iteration is used to add emphasis.
 - E. There are literal (phonemic) or verbal (semantic) paraphasias, circumlocution, augmentation, or perseveration.
 - F. There are non-specific referents such as "I had my thing up here" to indicate "I had a stroke on this side of my brain."
 - G. There is echolalia, except in such cases where inflection indicates a request for stimulus repetition.
 - H. There are comments on parts of the stimulus materials not germane to the response such as on item 14: "Well, it says to register with the receptionist. Her office is awfully small and she doesn't look very happy."
 - I. There is self-correction by way of successive approximations such as on item 35: "The gas tank is /pɛmpi, pɛnti, ɛnti, ɛmti/" or, item 23: "He's fumin', no, cigarette, no, smokin'."
 - J. There are word-finding problems as on item 40: "Well, the car's got a, oh, a bad, oh, you know, the thing you put on, a bad tire."
- II. "1" scores for Efficiency are entered for responses where:
- A. A CADL "2"
 - 1. is achieved by speaking, writing, or gesture and meets all other efficiency criteria
 - 2. is accompanied by "I can't," "I don't know," and the like
 - 3. is achieved on a requested repeat

- B. A CADL "1" is achieved only through a combination of oral and gestured or oral and written response, such as on item 4: (Spoken) "I live at....." (then written) "Franklin."
- C. There are syntactic, morphologic, and/or lexical deviations from Standard English, which are characteristic of any of the dialects of English.
- D. There are questions about the Examiner-spoken stimulus or about the stimulus materials. These are considered in the same way as a request for repeat.
- E. There are indicators of involvement in the role-playing nature of the test, so long as the utterances are relevant to the item. In item 14, for example: "Well, the sign says 'All patients must register with the receptionist' so I'll go over there to her."
- F. There are metalinguistic comments.
- G. There are self-corrections without successive approximations.
- H. There is parallel talk or "thinking out loud" such as in item 39: "Let's see here, the sign says 50, I'm going 80 so 30, I'd have to slow down 30 miles."
- I. There is slurring of speech; dysarthria is not penalized as long as the response is intelligible.

APPENDIX C

Sample Scoring Combinations

| CADL | O | E | Examples |
|------|---|---|--|
| 0 | 0 | 0 | No response; moaning/grunts; fully unintelligible |
| 1 | 0 | 0 | Written or gestured response scoring 1 for CADL; for example, shakes head "No" without correcting examiner on item 3; points to the flat tire in item 40 without indicating flatness; writes "cane" without indicating blindness in item 49, and the like. |
| 2 | 0 | 0 | This pattern is a somewhat unusual one; however, it would pertain should a patient write "I had a sp sr stroke" in response to item 9, for example. In this instance, a fully functional response was produced through successive <u>written</u> approximations. |
| 0 | 1 | 1 | Not possible; 0 score for CADL is automatically scored 0 for Efficiency. |
| 1 | 1 | 1 | CADL 1 is achieved through a combination of gestured/written <u>and</u> spoken response, as in item 33; Patient: (says) "You go" then writes "Fifth Avenue." |
| 2 | 1 | 1 | Maximum possible score combination. Meets all criteria for CADL 2, is spoken, and violates no Efficiency criteria. |
| 0 | 0 | 1 | Not possible; see above |

| | | | |
|---|---|---|---|
| 1 | 0 | 1 | Not possible; non-oral CADL 1 is automatically scored 0 for Efficiency |
| 2 | 0 | 1 | A gestured or written CADL 2. For example (item 25): Examiner: "...what's been bothering you lately?" Patient: (gestures to head and stomach, grimacing in pain). |
| 0 | 1 | 0 | CADL 0 score which is oral but not efficient (CADL 0 is always Efficiency 0 but if spoken in accordance with criteria for Orality, it may be credited here). For example on item 3 a patient might say "Yes," or on item 66 might say "Boy we will." |
| 1 | 1 | 0 | A spoken CADL "ballpark" response violating Efficiency criteria. For example (item 23): Examiner: "What's happening in this picture?" Patient: "He's using one of those, tobacco, oh, paper, match. It's burning, you know, he's smokin'" or (item 38): Examiner: "What should happen?" Patient: "Too mast, past, fast, oh, I can't." |
| 2 | 1 | 0 | A fully functional CADL response which is spoken but violates efficiency rules. For example (item 1) "Hello Mr./Ms. ____." Patient: "Hello, how are you today? Actually, this is the first day in a week I've felt like being out. I have terrible arthritis, you know, and this weather doesn't help ..." or (Item 14) Examiner: "You and the person with you walk into Dr. Clark's waiting room. What does the sign tell you to do?" Patient: (reads the sign, then) "I'm not sure I want to be here today. The waiting room is crowded and that lady looks mad." |

DISCUSSION

- Q: Were the Broca and Wernicke groups equal in terms of severity?
- A: Not on the basis of CADL scores. These two groups' means were significantly different. Originally, this comparison was carried out between two much larger groups designated as "fluent" (Wernicke, conduction, anomic, and transcortical sensory aphasia types) and "nonfluent" (Broca global, and mixed types). When the mean CADL scores for these seven types are calculated and the groups are arranged hierarchically from highest (anomic being close to normal CADL performance) to lowest (global), Broca and Wernicke groups fall in the middle, and in that order. Since these latter two represent the prototypic nonfluent and fluent aphasic types, it was decided to compare these and eliminate all the higher- and lower-scoring groups as one way to limit the effect of severity. Both comparisons yielded significant results. The former group difference was considerably more significant than the latter (reported here) but the direction of the differences remained the same.

- Q: Is it possible that differences in the aphasic components between the Broca and Wernicke groups would disappear if concomitant apraxia of speech were factored out of the former group?
- A: That's hard to say. While it is possible to factor aphasia out of motor speech disorders by reasonably valid means, right now separating motor speech disorders from aphasia is a far less precise procedure, since about 90% of Broca aphasias are accompanied by buccofacial praxis difficulties.