A Call for Investigation Into Focusing Aphasia Treatment Using Alternative Scoring Methods for *Communicative Abilities in Daily Living*

Appel de recherches sur l'orientation du traitement de l'aphasie au moyen de nouvelles méthodes de notation des capacités de communication dans la vie quotidienne

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Abstract

The standard scoring technique for *Communicative Abilities in Daily Living (CADL)* (Holland, 1980) results in a single raw score total of the 68 item scores on this test of functional communication skills. The test itself is not intended to provide a guide to treatment and the raw score total provides little insight as to the qualitative aspects of a patient's performance. Three additional methods for scoring the instrument are described here (form, category, and modality analyses) along with suggestions for and examples of how these methods — if later tested empirically — might be used to inform the focusing of communication treatment for aphasia.

Résumé

La technique standard de notation du ***Communicative Abilities in Daily Living*** *(CADL) (Holland, 1980) donne un seul résultat brut obtenu à partir des 68 items de ce test des aptitudes fonctionnelles à la communication. Le test ne vise pas comme tel à orienter le traitement, et le résultat brut donne peu d'indications sur les aspects qualitatifs de la performance du patient. Trois autres méthodes de notation sont décrites (analyses de la forme, de la catégorie et de la modalité), des applications sont suggérées et des exemples sont donnés pour illustrer comment ces méthodes, si elles font plus tard l'objet de tests empiriques, pourraient être employées pour orienter le traitement de l'aphasie sur le plan de la communication.*

Clinicians have used formal aphasia tests for a long time to begin formulating treatment regimens. Yet the exact relationship between test performance and the specifics of focusing and carrying out treatment has remained less than precise. In a panel discussion of aphasia classification, three of the participants (Aten, 1983; Darley, 1983; Holland, 1983) agreed that although there are tests that allow identification of aphasia type and severity and the status of functional communication, none exist that guide clinicians clearly to a treatment plan.

Holland (1980) did not conceive and develop *Communicative Abilities in Daily Living (CADL)* as a tool to guide treatment. But when it became available it provided a way to assess aphasic people's communication in more natural ways than previous tests allowed. Learning how well such individuals communicate day-to-day (functional communication) and improving on this ability as needed is a primary goal of aphasia therapy. However, CADL's scoring system yields only item scores and a single composite total. To be useful for focusing treatment, clinicians need better defined information on the nature of patients' communicative behaviors and the types of communicative tasks with which they experience particular facility or difficulty. To this end, CADL scoring was explored to see if additional manipulations might suggest more specifically which aspect(s) of patients' communication clinicians could address in focusing treatment for aphasia.

A brief summary of the test follows, as do descriptions of three proposed treatment-relevant methods for examining CADL performance.

Accompanying each description are sample patients' performances on CADL and an illustration of how their performance might lend focus to functional aphasia treatment. For all patients, the test was administered two months after sustaining their first left hemisphere, aphasia-producing stroke. All patients were fluent speakers of English who had a minimum of eight years of education, no history of previous neurological deficit lasting more than a day nor any pre-existing large silent cerebral lesions (identified by CT scan). All had visual acuity sufficient for reading regular manuscript size print and had no major medical illness that might be complicated by or that might interfere with testing.

The CADL Test

Communicative Abilities in Daily Living is a psychometrically sound, 68-item test of functional communication. Instead of constructing CADL around more traditional lin-

guistic notions, Holland framed the conceptual base for the test in speech acts theory (Searle, 1969), in the pragmatic aspects of language (Bates, 1976), and in the notion of communicative competence (Ervin-Tripp, 1973; Hymes, 1971). A largely interview-like format, inclusion of situations such as role-playing and apparent tester error further set this instrument apart from others. CADL's orientation to aphasia testing is unique in three additional ways that are relevant to the current discussion. They are CADL's scoring system, its acceptance of any successful communicative attempt (despite the modality through which it was produced) and the test's communicative categories. These are discussed below. The first two are interrelated and are considered together.

Scoring System and Modality Constraints

CADL's scoring relies on a three-point system adapted from that of Green and Boller (1974). Credit for a response does not depend on the communicative channel used but on the extent to which speakers convey their intent. The scores of 0 "dead wrong", 1 "in the ballpark", and 2 "correct" allow a maximum score of 136. This scoring system is a scale of functional adequacy reflecting how well people "get their points across" largely independent of either the modality used or the complexity and correctness of specific linguistic features. Thus, in contrast to other tests, test-takers can earn a maximum CADL item score of 2 for a spoken response, for fully-elaborated gestures, for writing, or for any combination of these, as long as they convey their point. In fact, they can earn a perfect total score of 136 without the testee uttering a word.

Communicative Categories

Traditional language tests used for aphasia assessment typically address skills such as the ability to point to examiner-named pictures or to produce a spoken narrative. By contrast, CADL taps 10 communicative acts. These are the abilities to (1) use communicative and environmental context, (2) express social conventions and (3) sequential relationships, to (4) read, write and calculate, (5) appreciate deixis, (6) role-play, (7) use speech acts such as informing and requesting, (8) appreciate non-verbal symbols, (9) engage in divergent thinking, and (10) appreciate humor, absurdity and metaphor. During her development of CADL, Holland (1980) found that patients with different types of aphasia tended to respond differently to the various categories. Examination of the categories also suggests that aphasic people as a group might perform items in some categories better than they do in others. For example, tasks requiring divergent thinking are typically difficult for people in this population (Chapey, Rigrodsky & Morrison, 1976).

Aten, Caligiuri, and Holland (1981) used CADL as the dependent variable in a study of functional communication treatment efficacy in a group of chronically aphasic people. They devised treatment activities that were similar to the structured role-playing and other situations in CADL but did not teach the test items themselves. Thus, clinicians can use the test as a guide for constructing a variety of global communicative situations to practice with patients either individually or in groups. The study suggests CADL to be sensitive enough to detect changes in patients' abilities to function in practiced communicative contexts. However, it is frequently desirable to evaluate people's performances in additional ways and to target specific areas for treatment. To accomplish this for functional communication as CADL measures it, it is informative to analyze test behaviors beyond the single numerical total score that the standard scoring procedure provides.

These three aspects of CADL — the scoring system, lack of response modality constraints, and the focus on categories of communicative behavior — suggest CADL item score analyses that could assist clinicians in focusing treatment for their clients with aphasia. Additional scoring methods based on these aspects of the test are Form, Category and Modality Analyses.

The Analyses

Form Analysis

The purpose of Form Analysis is to provide an account of the distribution of item scores that resulted in a particular total test score. For example, a patient could achieve a 50% raw score of 68 through earning one point on all 68 items, two points on half the items (with zeros on the rest), or by way of a variety of other item score combinations. In the first two examples, clearly patients earning full credit on half the test items but none on the rest will communicate differently from those who are able to get their listeners only "in the ballpark" (even if they do so consistently). The former speakers communicate either fully or not at all; the latter tend to give just enough information to allow their conversational partners to initiate a 20-questions type of interchange. Because of the nature of the communication that each point on the scoring scale represents, Form Analysis results in information that reflects the aphasic person's general communicative "form."

To carry out Form Analysis, count the number of test items on which a speaker earns scores of 0, 1 and 2. Examining the proportion of each adds clinically-relevant descriptive information to the total raw or percentage score. Specifically, an examiner can see what contributed most to the decrement in general communicative effectiveness: an absolute failure to transmit meaning informatively (a preponderance of scores of 0), an ability to convey only a partially informative message (primarily scores of 1), or some combination of both.

Evaluating communicative form in this way provides a more data-based (as opposed to an impressionistic) rationale for addressing particular treatment goals. With individuals who earn primarily scores of 1, clinicians might use techniques to promote increased communicative specificity or informativeness in their clients' communicative attempts. One approach to accomplishing this is use of Promoting Aphasics' Communicative Effectiveness (PACE) (Davis & Wilcox, 1985) to encourage aphasic people to use less preferred but more effective communicative channels. Techniques are also available to promote, for example, the use of gesture through techniques such as Visual Action Therapy (Helm-Estabrooks & Barresi, 1980) and drawing (Lyon & Helm-Estabrooks, 1987; Lyon & Sims, 1989).

By contrast, other individuals may most often fail to communicate any relevant information and so earn more scores of 0. Depending on the reason for these failures, such people may need to learn to take more communicative risks (initiating or continuing with a communicative attempt despite the potential for imperfect output). In this way patients might increase the likelihood of communicating in such a way as to earn more scores of 1 thereby getting their listeners "in the ballpark". If they are using a less productive communicative modality (see Modality Analysis), clinicians might promote using another that they can show produces more effective communication than the one used most frequently.

An example of how Form Analysis might be used is applied to the CADL performance of a 56-year old man with 11 years of education. By the BDAE typology, he demonstrated global aphasia with a rating of 0 on the BDAE Aphasia Severity Rating Scale. His total CADL score was 10. For 63 of the test items he earned 0 (for

Appendix A

RESPONSE FORM ANALYSIS

Patient _____
CADL # _____
Date _____
CADL Score _____

A. Purpose

To evaluate the means (in terms of item score combinations) by which patients arrive at a given total score.

B. Procedure

1. Tally the number of responses at each scoring level.
2. Calculate percentage of total test items represented by each score (x/68).

	0 Score	%	1 Score	%	2 Score	%
CADL 1						
CADL 2						
CADL 3						

C. Application

1. Use to obtain an overall measure of communicative adequacy. We often find patients who demonstrate "all or none" (i.e., primarily 0 and 2) response patterns. Clinically, it is important to devise ways to move 0s to 1s with such patients in order to assist listeners to understand the gist of the patient's message. Clinical effort needs to be spent on such patients to "get by" to be "in the ballpark."
2. Use this analysis on retesting to see if the patient's scores are changing in the desired ways. That is, check if patient is showing fewer 0 responses, supplanting them with 1s or 2s, or is moving 1 responses into the 2 category.

seven of these he gave no response at all). On the remaining five he earned scores of 2.

This man's pattern is illustrative of "all-or-none" responding. While extreme, his pattern provides a useful example of CADL test performance data that suggest the possible usefulness of a technique such as Visual Action Therapy (Helm-Estabrooks, Fitzpatrick & Barresi, 1982). Such a possibility is further supported for this man after identifying that 8 of the 10 points he earned were garnered through gesture (the remaining two through oral communication).

In summary, response Form Analysis consists of counting the number of item scores of 0, 1, and 2 that summed to the total CADL test score. Examining the relative proportion of each of the three scores may inform clinicians' choices of broad treatment goals. It could also guide their choice of tasks aimed at encouraging communicative risk-taking, increasing the specificity of patients' utterances, and (in combination with other analyses) using other communicative channels. Appendix A contains a worksheet designed to assist with Form Analysis.

Category Analysis

Category Analysis provides focus to treatment by identifying patients' differential ability to perform test items falling within each of CADL's 10 communicative categories. The general strategy for performing Category Analysis involves deriving the proportion correct for the items in each category. To do this, add the earned scores for each item in a

Appendix B

CATEGORY ANALYSIS

Patient _____
CADL # _____
Date _____
CADL Score _____

A. Purpose

To determine in which communicative category(ies) patients exhibit greatest strength and in which they exhibit weakness.

B. Procedure

Role Playing (10 items)

Item #	15	16	17	18	22	25	26	29	30	45	
1											= ____
Score 2											20

Social Convention (8 items)

Item #	1	15	18	22	45	66	67	68	
1									= ____
Score 2									16

Appendix B / Category Analysis (continued)

Speech Acts (21 items)

Item #	3	4	5	6	7	8	9	13	16	19	25	26	31	32	33	34	40	48	57	63	64	
1																						= ____
Score 2																						42

Speech Acts by Type:

Inform #	4	5	6	7	8	16	32	34	
1									= ____
Score 2									16

Explain #	9	13	25	33	40	63	64	
1								= ____
Score 2								14

Other	3	19	26	31	48	57	
1							= ____
Score 2							12

Divergencies (7 items)

Item #	26	29	41	46	52	61	62	
1								= ____
Score 2								14

Utilize Context (17 items)

Item #	12	13	17	21	23	29	35	37	39	40	42	46	47	49	51	54	58	
1																		= ____
Score 2																		34

Deixis (6 items)

Item #	2	12	22	43	50	65	
1							= ____
Score 2							12

Sequential Relationships (9 items)

Item #	10	23	36	38	44	50	51	56	58	
1										= ____
Score 2										18

Appendix B / Category Analysis (continued)

Non-Verbal/Symbolic (7 items)

Item #		21	24	35	49	53	59	60	
	1								= ___
Score	2								14

Read/Write/Calculate (21 items)

Item #		10	11	12	14	20	23	27	28	30	34	37	39	42	43	44	50	52	54	55	56	58	
	1																						= ___
Score	2																						42

Humor, Metaphor, Absurdity (4 items)

Item #		24	29	61	62	
	1					= ___
Score	2					8

1. In the box corresponding to each item, mark the patient's obtained score. Total the scores for each catetory and enter the sum in the numerator of the fraction to the right. Calculate proportions.

2. List categories in descending order to proportion scores.

	CATEGORY		PROPORTION	
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

C. Application

1. Use to plan work in areas of functional deficit. Or, use strengths to advantage.
2. Later on, does hierarchy remain the same?
3. For speech act category, sub-categories are useful for speech-acts focus to treatment.
4. What category is strength? Weakness? Apply clinically.

category and divide this sum by the total points possible for that category. After calculating all proportions, arrange the categories hierarchically from strongest to weakest. Brookshire (1978) suggested that it is advisable to begin treating behaviors that patients perform at levels from 60% to 80% "correct". The calculated proportions may be used to identify and target for treatment the communicative categories that are at these *treatable* levels.

> The CADL test performance of a 65-year old man with 16 years of education provides an example of the application of Category Analysis data to focusing aphasia treatment. He had a BDAE aphasia severity rating of 1, a Broca type aphasia, and a total CADL score of 114. For each of the 10 CADL categories, he achieved the following proportions (in descending order): role-playing (100%), social conventions (100%), divergencies (92.8%), deixis (91.7%), utilizing context (91.2%), sequential relations and read/write/calculate (83.3%), speech acts and non-verbal/symbolic (71.4%), and humor, metaphor and absurdity (62.5%). By Brookshire's criteria, the last three categories are in the treatable range. Interestingly, this man seems to do well with items in which role-playing is required and seems to make good use of context. The data revealing these strengths provide the empirical basis for a clinical decision to engage in treatment activities using a role-playing paradigm. In it, the clinician and this patient might practice speech acts such as informing, explaining, denying, and the like.

To summarize, response Category Analysis is accomplished by calculating the proportion of the total possible points that patients earn in each communicative category. The proportions can then be arranged hierarchically to identify productive areas to address in treatment. Appendix B contains a worksheet designed to assist in carrying out Category Analysis.

Modality Analysis

As indicated earlier, CADL's evaluation of communication in aphasic people allows credit for any fully or partially communicative response, irrespective of the modality through which they produce it. Noting the modality(ies) a patient uses on each item permits clinicians to identify the modality through which that person communicated most successfully. As this, typically, is not the communicative channel most frequently used, Modality Analysis clarifies the contrast. This clarification is the purpose of response Modality Analysis.

The general strategy for Modality Analysis is as follows. First, eliminate from the analysis the 14 items that essentially demand the use of a particular response modality. Such an item is #17 in which the examiner asks the test-taker to produce some identification. People can comply with this request only through a gestural response involving showing an item such as a driver's license or an identification bracelet. By contrast, other items such as #7 (asking how many children the testee has) can be answered orally, in writing, or by drawing or gesturing.

For the remaining items on the test, the examiner notes — along with each item score — the modality or modality combination the patient uses to achieve the score. To carry out the Modality Analysis, then, first count the items responded to using each modality or modality combination. This reveals the patient's most typical response channel. Multiplying each of these numbers by 2 produces the total possible points the person could have received had s/he earned a full score of 2 on each item using the noted modality(ies). Next, calculate the actual score earned in each modality (or combination) by counting the number of items responded to in the modality(ies) that received scores of 0, 1 and 2. Multiply each of these numbers by the appropriate score and sum the three products. Finally, to calculate the success score, divide the actual score earned by the total points possible in that modality.

When these computations have been completed, arrange two hierarchies. The first reflects (in order) the modalities with which a person responded from the one most frequently to those less frequently engaged. The second hierarchy reflects the success with which patients engaged the various channels. Often the two derived hierarchies contrast, and a patient's most frequently used communicative channel may not be the one through which s/he achieves the greatest communicative success. Clinicians may derive data to support their emphasis on a modality in addition to (or instead of) speaking from the hierarchy established here. This discrepancy also is useful for illustrating to patients and their significant others the rationale for pursuing non-speech communicative goals along with emphasis on oral communication.

> To illustrate the use of Modality Analysis in focusing aphasia treatment, the CADL performance of a 57-year old man with 12 years of education is examined. He demonstrated a Wernicke type aphasia. His aphasia symptoms were rated 1 on the BDAE Aphasia Severity Rating Scale and he earned a total CADL score of 67. The latter was achieved through the use of two single communicative modalities and one modality combination. Of the 54 items that can be used for Modality Analysis, this man responded to 36 using speech, to 8 by gesturing, and 6 through a combination of speech and gesture. He did not respond to the remaining four items. Despite his consistent attempts to use oral

communication, this communicative channel proved to be nearly as unsuccessful in garnering points (47.2% of the total possible on the 36 items) as was his use of gesture alone (43.8% of the total points possible on the 8 gestured responses). Although he used the gesture and speaking combination on only six items, this patient earned 66.7% of the possible points on these items. This suggests that while either channel alone may have provided insufficient information to convey meaning to a listener, the combination may have been mutually supplemental, resulting in the patient earning a greater proportion of points when he used the two means

Appendix C

MODALITY ANALYSIS

Patient _____
CADL # _____
Date _____
CADL Score _____

A. Purpose

1. To determine the patient's typical response mode.
2. To determine the patient's most successful response mode.

B. Procedure

1. Eliminate CADL items 2, 17, 20, 41, 42, 50, 53, 54, 55, 56, 59, 60, 61, 62.
2. For the remaining items, tally the number of items responded to using the modality(ies) indicated. These are the "typical modalities."
3. Multiply each of the numbers in step #2 by two to obtain the "possible score."
4. Under each modality, figure how many points the patient earned via that modality by multiplying the scores (0, 1, or 2) by the number of items in that modality which received each of those scores. Then add these three products. This is the "score earned."
5. To derive the "percent score" or "successful modalities" divide the score earned by the possible score (i.e., divide line three by line two).
6. Arrange patient's "typical modalities" on the left in descending order of usage. On the right, list the patient's "successful modalities" in similar fashion.

	Gesture	Speak	Write	Gesture + Speak	Gesture+ Write	Speak + Write	Other (Specify)
Item Tally Typical							
Possible Score (Tally x 2)							
Score Earned	0= 1= 2=	0= 1= 2=	0= 1= 2=	0= 1= 2=	0= 1= 2=	0= 1= 2=	0= 1= 2=
Successful Modalities (% score)							

Appendix C / Modality Analysis (continued)

Typical Modalities	Successful Modalities
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.
6.	6.
7.	7.

C. Application

1. The derived hierarchies most usually contrast and patients' most frequently used communicative channel(s) are not those through which they achieve the greatest communicative success.
2. This discrepancy can be pointed out to patients and their significant others in a clearly data-based way to provide external validation to your plans to address non-speech goals.
3. The data to support your emphasis on modalities in addition to speaking may well be derived largely from the modality hierarchy established here.

together. A more extensive probe of this possibility, if the results were consistent with this Modality Analysis, would suggest that a clinician might encourage this man to combine communicative channels so as to allow him the possibility of communicating more successfully through these means.

In summary, Modality Analysis highlights the possible contrast between the communicative modality aphasic patients use most frequently and that through which they achieve the greatest success. A worksheet for performing Modality Analysis is presented in Appendix C.

Summary

This paper describes *Communicative Abilities in Daily Living* and three procedures to assess patients' performance on it beyond standard scoring that yields a unitary total score. Form Analysis allows clinicians to assess the item score distribution that resulted in the total score. This distribution reflects the general form of an aphasic person's communicative attempts. Category Analysis provides detail regarding the relative success patients experience in performing the 10 communicative acts included in the test instrument. Modality Analysis permits comparison of the communicative channels used most frequently with those through which patients achieve the greatest success. These analyses have the potential — should they later be supported empirically — to inform an important clinical function: providing a data-based rationale for focusing aphasia treatment.

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