

A Practical Procedure for the Grammatical Analysis of Aphasic Language Impairments: The LARSP

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During the past decade there has been a resurgence of interest in the syntactic and grammatical disabilities of aphasic patients. In particular, investigators have identified a receptive agrammatism which parallels the verbal expressive component in Broca's aphasia (Bradley, Garrett and Zurif, 1980; Caramazza and Zurif, 1976; Heilman and Scholes, 1976; Samuels and Benson, 1979; Swinney, Zurif and Cutler, 1980; Zurif, Caramazza and Myerson, 1972). Although the theoretic contribution of this research has been formidable, direct clinical application has not been forthcoming. Regarding productive grammatical impairments, deVilliers (1974; 1978) and Goodglass and his colleagues (Myerson and Goodglass, 1972; Goodglass and Gleason, 1972; Gleason *et al.*, 1975) have demonstrated a fairly predictable, although not invariant, order of difficulty for production of specific grammatical structures in Broca's aphasia. However, a limited number of constructions have been analyzed in these studies, and hierarchies of grammatical constructions which have been generated are based on a small sample of subjects. It is not surprising, therefore, that the order of difficulty of grammatical constructions which has been generated may not be valid for individual aphasic patients (Salvatore, Holtzapple, Trunzo, Graham, 1983). Moreover, clinical aphasiologists interested in developing treatment programs for the syntactic or grammatical deficits of their aphasic patients cannot rely on the results of standardized aphasia tests for guidance since this level of language is virtually ignored in the analysis methods provided by most comprehensive tests of aphasia. There is, therefore, an obvious need to examine practical analyses of, and treatment for, the grammatical aspects of aphasic language. One grammatical analysis procedure which is currently popular in Great Britain, the Language Assessment Remediation and Screening Procedure (LARSP; Crystal, Fletcher and Garman, 1976; Crystal, 1979), will be discussed in the remainder of the paper. The purpose of this paper will be threefold: First, the rationale behind the LARSP will be explained and the analysis procedure will be outlined. Second, a sample analysis will be presented for a patient with Broca's aphasia. Finally, the strengths and limitations of the LARSP will be discussed.

THE LARSP: AN OVERVIEW

The LARSP was developed from within structural linguistics and it has proven useful for the diagnosis and treatment of language disorders in children (Crystal, Fletcher and Garman, 1976; Crystal, 1979, 1982). The analysis is based on a descriptive "Grammar of Contemporary English" (GCE) (Quirk, Greenbaum, Leech, Svartvik, 1972) in which clause, phrase and word structure levels are considered.

In the LARSP analysis each utterance is examined and clause, phrase and word elements are tallied in one of seven stages of syntactic complexity (Appendix I). Based on the developmental order of acquisition, the seven stages range from one-word, holophrastic utterances (Stage I), through sentences of four or more elements (Stage IV) to analysis of discourse structure (the final stage).

The analysis procedure involves consecutive scans of a spontaneous speech sample for the purpose of categorizing grammatical structures at one of the seven stages. Each evaluation of the corpus is undertaken with a specific goal in mind and the result of each scan is tabulated on the LARSP profile chart (Crystal et al., 1979). A sample profile chart for a patient with Broca's aphasia is provided in Figure 1. A glossary of symbols which are used on the profile chart is included in Appendix II.

During the first scan of the spontaneous speech sample the examiner tallies unanalyzable or problematic utterances. These sentences are then coded under Section A of the LARSP (Figure 1). The goal of the second scan of the data is to determine the general types of responses produced by the patient and the results of this analysis are categorized under Section B on the profile chart. The number of questions, repetitions, elliptical, and abnormal responses produced are determined during this review of the data. The number of spontaneous responses produced are also tallied under Section C of the profile chart during the second scan. After examining unanalyzable or problematic utterances and evaluating the patient's overall response pattern in the first two scans, the remaining scans are used to examine sentence, clause, phrase and word structure patterns.

That is, the examiner categorizes utterances within one of the seven LARSP stages for each of these levels and then completes the profile chart (Figure 1). It should be noted that elements of a single utterance may be classified at different stages at each level of analysis. For example, the sentence "The woman washed the dirty dishes" would be categorized as a stage IV sentence ("XY + C/O:NP" in Figure 1) with subject, verb and direct object clause elements. However, the sentence contains a Stage II Determiner-Noun Phrase ("The woman") and a Stage III Determiner-Adjective-Noun Phrase ("the dirty dishes"). Similarly, at the word level, Stage II credit would be given for marking the past tense in "washed" and Stage III credit would be given for designating plurality in "dishes." The Sample analysis which follows further demonstrates the LARSP analysis procedure.

SAMPLE ANALYSIS AND DISCUSSION

Patient Description:

A.W. is a 53-year-old male who had a single, left-sided, thromboembolic CVA. He was 6 years post onset of aphasia at the time of analysis. His overall performance on the Porch Index of Communicative Ability (PICA; Porch 1967) placed him at the 50th percentile. Performance on verbal subtests placed him at the 52nd percentile; scores on gestural and graphic subtests of the PICA resulted in the 37th percentile and 62nd percentile respectively. Additionally, the "Rating Scale Profile of Speech Characteristics" from the Boston Diagnostic Aphasia Examination (BDAE: Goodglass and Kaplan, 1972) resulted in the classification of Broca's aphasia.

Speech sample and preliminary analysis. The speech sample used for this analysis was obtained during a 20-minute open-ended conversation. A total of 284 utterances were produced by the patient. These utterances served as the basis for the LARSP analysis summarized in Figure 1. During the first scan of the corpus it was determined that 73 utterances, or 26% of the sample, were either unanalyzable or problematic. Examination of Section A on A.W.'s profile revealed that unintelligible and syntactically deviant responses accounted for the majority of the responses which could

A Unanalysed			Problematic							
1 Unintelligible	21	2 Symbolic Noise	7	3 Deviant	26	1 Incomplete	5	2 Ambiguous	14	
B Responses										
Stimulus Type		Totals		Normal Response				Abnormal		Problems
				Elliptical Major						
				Full Major Minor				Structural		
				Repetitions				β		
41	Questions	39		1	2	3	4	2	13	1
17	Others	13		1	7	1		5		
Spontaneous		159		41		Others				
C										
Minor 36 Social 26 Stereotypes 9 Problems 1										
Major 123				Sentence Structure						
Excl. Comm. Quest.				Statements						
				V: 7 V: 27 N: 62 Other 27 Problems						
Sentence Type		Conn.		Clause			Phrase		Word	
Stage I (0.9-1.6)	V	Q				SV	VC:O 10	DN 21	VV	
Stage II (1.6-2.0)	1	1	SV:O 2	AX	Neg X 1	Other 1	Adj N 47	V part 3	Int X 4	
Stage III (2.0-2.6)	VXY 1 Int XY	QXY 2 VS	X: S:NP	X: V:VP 7	X: CO:NP 10		A: AP		Cop 5	
Stage IV (2.6-3.0)	S	QVS	SVC:OA	VC:OA	D: Adj N	Adj Adj N 4		Aux 11	Pr DN	
Stage V (3.0-3.6)	wh	tag	SVA	VO:O	Other	N Adj N		Other 7	-	
Stage VI (3.6-4.6)	and	s	XY: S:NP	XY: V:VP 7	XY: CO:NP 11		Y: A: AP		N't	
Stage VII (4.6-5.1)	what	Other	SVC:OA	AA:XY	NP: NP		Neg V 9		cop	
				SVO:O	Other		Pr D Adj N		5	
				Coord. 1	1	Postmod. clause		-		
				Subord. 1	1	Postmod. phrase		-		
				Clause: S		cX		2	Aux	
				Clause: C/O		XcX		Other	-	
				Comparative		(-)		-	-	
				(+)		(-)		-	-	
				NP		VP		Clause		
				Initiator		Complex		Passive Complement		
				Coord		Pron		Adj seq		
				Other		Det		N irreg		
				Discourse		Modal		Tense		
				A Connectivity		V irreg		Concord		
				Comment Clause		A position		W order		
				Emphatic Order		Other		Style		
Total No. Sentences		211		Mean No. Sentences Per Turn			4.4			
							Mean Sentence Length			
							1.8 words			

Figure 1. LARSP profile for a Broca's aphasic patient (A.W.)

not be analyzed. Deviant responses, which accounted for 36% (26/73) of the unanalyzed utterances, were productions that were not permissible syntactic forms in the English language. Many of the deviant responses resulted from word order problems. The largest category of problematic responses consisted of productions which were syntactically ambiguous.

The results of the second scan of the data are shown in Sections B and C of the patients' profile. Examination of Section B revealed that of the 211 utterances analyzed, 52 were in direct response to the examiner's questions (39) or 'other' stimuli (13). It was interesting to note that 30 of the directly elicited responses were elliptical in nature. As shown in Section C, spontaneous responses, those not directly elicited by the examiner's questions or statements, accounted for 64% (159/211) of A.W.'s productions.

Of the spontaneous utterances produced, approximately one-fourth (41) were self repetitions. For example, when probed about how much he smoked-- A.W. replied, "smokin, smokin, smoking." These reduplicated utterances, which were found throughout the sample, were prosodically varied to effect our interpretation of the utterance. Crystal et al. (1976) discussed the use of reduplicated utterances in a similar vein. They noted that "reduplicated sentences (are) apparently for the purpose of producing a well-known segmental vehicle over which prosodic contours might be established indicating agreement, exasperation, acknowledgement and so on" (page 165). This is an area which we plan to explore further in the future.

LARSP STAGE ANALYSIS

Let's examine the Stage Analysis portion of A.W.'s LARSP profile (Figure 1). Recall that Stage I utterances are essentially holophrastic or one word "sentences." Two sentence types--Major and Minor are examined in Stage I. Thirty-six minor sentences, primarily social comments and stereotyped responses, accounted for 23% of Stage I responses and 123 single-word major 'sentences' (i.e. verbs, nouns, other) accounted for 77% of Stage I utterances. Surprisingly, Stage I utterances constituted 75% of all analyzable utterances. Looking closer at Stage I major "sentences" we noted that 62 of those utterances were isolated nouns ('N') and more than twice as many nouns were produced as verbs (27) or other (27) Stage I responses. To summarize, A.W.'s single word Stage I utterances were characterized by overproduction of nouns, repeated use of a few verbs, isolated production of 'wh' questions and miscellaneous 'other' responses.

Let's now turn our attention toward A.W.'s multiword utterances. These were primarily clustered within Stages II through IV of the LARSP profile. Again, these stages loosely correspond to two-, three-, and four-word utterances. There were fourteen Stage II clauses in the corpus. Ten of these were Verb - Complement or Verb - Object constructions (V C/O). The majority of all clause structure elements produced by the subject were, however, classified as Stage III utterances. Although 30 Stage III clauses were produced, there were few Stage IV clauses produced by A.W. in this sample. The predominant use of nouns and underdevelopment of A.W.'s verb system was also seen in the clause analysis, where his phrasal expansions were in the direction of noun phrase rather than verb phrase.

In general, a comparison of the clause and phrase levels at stages II through IV demonstrated relatively weak clausal development and somewhat

stronger, though equally unbalanced, phrase structure. Examination of Stage II phrases revealed that two types of constructions dominated the profile. Determiner and Noun (DN) construction accounted for 27% (21/78) of the phrases and Adjective and Noun (Adj N) accounted for an additional 60% (47/78) of the Stage II phrases. There were a few examples of other two-element phrases in the sample, but the striking feature of the Stage II phrase analysis was the predominant use of nominal forms and the relative paucity of other constructions.

A similar pattern was apparent for Stage III phrases, where pronouns accounted for 60% (41/68) of all phrasal elements. Again we clearly see a pattern of nominal forms dominating verb forms. With the exception of Negative-Verb forms (Neg V), the profile revealed a striking lack of production of phrase elements for Stages IV through VII.

The word level of analysis of the LARSP is intended to identify the patient's use of inflectional endings. Three inflectional endings appeared with relatively high frequency in A.W.'s profile. The present participle form -ing accounted for 24% (12/49) of the inflectional markers; pluralization accounted for 57% (28/49). Reduplicated utterances and stereotypic use of a restricted number of lexical items accounted for much of the profile at the word level. For example, ten of the twelve instances of -ing usage resulted from a single reduplicated form. The absence or underuse of constructions was striking. A number of important grammatical markers, including past tense, past participle and contracted auxiliary forms, were never produced in the sample.

CONCLUSIONS

The LARSP, like all analysis systems, has several limitations which should be considered. First, the analysis is time consuming. It takes several hours for a practiced clinician to complete the analysis, and considerable time is needed to learn the system. This limitation may be counterbalanced by the amount of information obtained and the time saved in treatment planning. Secondly, because of the high percentage of unanalyzable responses which are likely to occur, the procedure may have limited value with severely involved patients. The LARSP has been used primarily with children and its limitations with aphasic patients are not fully understood.

Despite these limitations, we have found the LARSP to be a practical means of identifying patterns of grammatical deficit. It has, for example, increased our awareness of the prosodic aspects of transcription and has helped us to identify aphasic strategies such as the use of reduplication. In addition, the LARSP approach is based on a surface structure analysis and there is a minimum of theoretic assumptions associated with it. The LARSP functions as a relatively comprehensive descriptive taxonomy that makes few assumptions about underlying linguistic forms.

Finally, and perhaps most importantly, the results of a LARSP analysis are directly applicable to treatment planning. As we have seen from A.W.'s profile, patterns of grammatical deficit can be identified and treatment goals can be generated. It is clear, for example, that an important goal of treatment for A.W. would be to expand the variety of verb forms used and to develop phrase and clause level verb strategies. The LARSP may prove to be a valuable addition to the clinical aphasiologist's diagnostic battery.

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APPENDIX I

LARSP 'STAGES' OF LINGUISTIC DEVELOPMENT

- Stage I: One-element 'sentences'
- Stage II: Two-element sentences
- Stage III: Three-element sentences
- Stage IV: Sentence of 4 or more elements
- Stage V: Recursion
- Stage VI: System completion
- Stage VII: Discourse Structure, Syntactic Comprehension and Style

APPENDIX II

GLOSSARY OF SYMBOLS

A	Adverbial
A pos	adverbial position
Adj	adjectival
Adj seq	adjectival sequence
Aux	auxiliary
'aux	contracted auxiliary form
c	coordinator
C	complement
Comm	command sentence type
conn	connectivity marker
cop	copula
'cop	contracted copula form
D	Determiner
Det	determiner system (errors)
-ed	past tense
-en	past participle
-er	comparative
-est	superlative
Excl	exclamatory sentence type
FA	Forced alternative (question)
gen	genitive
I	initiator
-ing	present participle
Int	intensifier
let	first person command
-ly	adverb marker
Mod	modal verb (errors)

N	noun
'N'	noun-like element Stage I
N Irreg	irregular noun inflections (errors)
Neg	negation
n't	contracted negative form
pl	plural
postmod	
clause	postmodifying clause
postmod	
phrase	postmodifying phrase
Pr	preposition
Pron	pronoun
Q	question-word
'Q'	Stage I question-word
Quest	question sentence type
s	subordinator
S	subject
+S	expressed subject in a command
TG	transformational-generative main
	verb (at phrase-structure level)
v	main verb (at phrase-structure level)
V	verb
'V'	verb-like element at Stage I
V imp	imperative verb
V irreg	irregular verb inflections (errors)
Voc	vocative
WO	word order (errors)
X,Y,Z	cover symbols for elements of structure
3s	third person singular
/	tone-unit boundary
↗	nuclear-tone--rising
↘	nuclear-tone falling
—	nuclear-tone level
↘↗	nuclear-tone falling-rising
'	indicates following syllable is stressed
.	brief pause
—	unit length pause
— —	double length pause
— — —	treble length pause
? — —	indicates doubt about transcriptional accuracy
(...)	uninterpretable speech
((...))	brief or incomplete utterance
*	utterance overlap

DISCUSSION

Q: How did you do the opening conversation to get the sample of the gentlemen?

A: It was just an open ended conversation.

Q: Did you use a question format?

A: It wasn't intended that way but, because of the patient's level of involvement, there was a high proportion of questions versus 'other' stimuli. One aspect of the LARSP is responsiveness to questions versus 'other' stimuli--statements, for example. For this patient, there were no significant qualitative differences in types of responses elicited by questions versus statements. Questions were, however, the predominant form of elicitation.

Q: And that could somehow govern what you are getting.

A: It could, but the format was dictated by the patient.

Q: I was interested in the "deviant" category. You said that they were not as rule-ordered as normal syntax. Do you have an example of what you got?

A: He used two types of deviant responses. He would say things like "Me take out," or "1 year quit smoking." Either word order violations or inappropriate use of a specific grammatical form predominated.

Q: He was penalized for those types of responses?

A: Yes. I might say, though, that we didn't throw all of that information out. Deviant responses, problematic utterances and unintelligible responses are set aside for further analysis. This brings up an important point. You have to get a large corpus so that you have a sufficient sample across all levels. Otherwise, you may have a lot of unanalyzed responses. To come back to the question - we did our own error analysis of 'unanalyzed' responses to help figure this patient out.

Q: Did you find some particular type of error?

A: Word order errors, deletion of grammatical markers and inappropriate use of forms such as pronouns were the three types of deviant responses that were difficult to put into the taxonomy.

Q: I would have a hard time saying they were not rule governed.

A: I would too - I think it was rule governed. We discovered that by going back and reanalyzing such responses. Deviant responses are not, however, further analyzed in the LARSP. It's good information but it doesn't fit the taxonomy.

Q: I have two questions. One pertains to subclassification and percentages you got for inflections. For ing endings you tally repetitions. Why did you do that? Second, when you were looking at pronouns you had a very hypersensitive pronoun count. Was it related to the type of discourse which you had? With a different analysis you might have a completely different proportion of responses. The last question

pertains to the implications for therapy. What are your thoughts on rehabilitation in terms of expanding their sentences into noun/verb sequences.

A: The first question related to ing forms and counting reduplicated utterances. We followed the suggested procedure. However, we also looked at all multiple utterances to determine type-token ratios, even though the recommended procedure is to tally repetitions. Again, the LARSP has been used mostly with children who don't have multiple, reduplicated utterances. So we went by the book, so to speak, and counted repetitions but then we went back and figured type-token ratios for those types of forms as well as verb forms. The second question was related to pronouns?

Q: It was pronoun I only wasn't it?

A: Pronoun I is counted in the analysis but this patient was restricted in this sample to use of the pronoun me. Often times it was used inappropriately. Again, you have the problem of counting reduplicated utterances. However, we did a retrospective analysis which helped us determine whether that needed work also. Your third question related to treatment suggestions and expansion of the verb element. I think some of the suggestions for 'verb as a core' therapy that Dr. Loverso and his colleagues have talked about would probably be appropriate. I think the analysis highlights the fact that we have to pay attention to verb elements in therapy. Perhaps we should also examine what the Russians call "preventive therapy." This was a very chronic patient, 6 years post onset of aphasia, and we suspected that he got a lot of "nouncing" in therapy. He communicates well because of these reduplicated utterances and because of his use of interesting and varied inflection. But he does predominately use the nominalized form. I think that the types of therapy that I just mentioned, so call "preventative therapy," concentrating on verb forms, and perhaps combining verbs and other elements using Dr. Loverso's techniques might be appropriate.

Q: Do you think you will start using this procedure as a matter of course in your shop for the type of patient you talked about?

A: We started out looking at the LARSP for research, but I think that the answer is yes we will be using it clinically. I expected somebody to note that semantics and other language levels aren't represented. But, we felt that the "baby was thrown out with the bath water" during our recent emphasis on semantics and pragmatics. We weren't doing much in the area of syntax and decided that we ought to do more.

Q: I referred Sunday night to the study by Clare Penn who is at the University of South Africa. What she did was to look at the LARSP in conjunction with a pragmatic analysis. She used a large number of subjects and I think she very convincingly demonstrated the relationships that could be pulled from the two different forms of analysis by looking at aphasia in a fairly complete way. It's very compelling study.

A: I would just like to say that we found that you can't ignore semantics or pragmatics. For example, in the deviant category our tendency was to think semantics and not syntax. There is an interrelationship that can't be ignored.

- Q: In your experience, is it possible for someone to pick up the LARSP book and apply the system after reading the book?
- A: After several readings of the book. I don't find the book very readable, actually. Our experience was that we were "gun shy" until we forced our way through it. Once we did, we felt more comfortable with it. We didn't mention reliability and we didn't formally assess it. However, Nina and I independently did the analysis and we had surprisingly good agreement. I do think it is difficult to do initially, but once you get over that hump it provides a nice addition to the other batteries we use.
- Q: It sounds to me that it's useful for people who are obviously impaired. If you had somebody that was mildly impaired, you wouldn't know it in the end unless you did some sort of pragmatic analysis too -- is that right?
- A: I wouldn't use it alone for any type of patient. One thing we're toying with is to use it with right hemisphere involved patients. We have found that some of our right hemisphere patients do things that this may help tease out. I'm not sure that it wouldn't be useful with mildly impaired patients.
- Q: Depending on your way of getting a sample, you would expect a person to give qualitatively different responses. I'm suggesting that you're controlling your output syntactically as well as semantically.
- A: That's always true, but our analysis showed no differences between the patterns obtained from different types of examiner input. The conversational sample was meant to be very open ended and the topics were extremely varied. It wasn't static.
- Q: But, there's a lot of variability in how you talk or elaborate, depending on your personality.
- A: Some people give you a one word response and some people go on and on. I think the pattern of deficit is what you look for and the pattern was revealing because it cut across the clause level, phrase level, and word level analysis.
- Q: There are very specific syntactic devices that are used to signal new versus old information. So the intergration between pragmatics and syntax, using this kind of device, could be really useful - especially with the agrammatic individual.
- A: We think so too. For example, we have extensive speech samples of right hemisphere involved patients. We started out doing acoustic analyses but found that we were remiss in terms of prosodic elements. We got involved because we thought maybe the combination, as you're suggesting, would give us something else. Finally with regard to sample types, Crystal et al. (1976) suggests fairly specific procedures for eliciting samples. That is, they suggest a half hour sample. Fifteen minutes of that sample should be devoted to non-immediate topics and the remainder of samples should include dynamic topics from the immediate environment. So I think there are things that can be manipulated and studied experimentally.