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APPLICABILITY OF THE C.I.D. GRAMMATICAL ANALYSIS OF ELICITED LANGUAGE-SIMPLE SENTENCE LEVEL TO CHILDREN EDUCATED IN TOTAL COMMUNICATION

by

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APPLICABILITY OF THE C.I.D. GAEL TEST-SIMPLE SENTENCE LEVEL TO HEARING-IMPAIRED CHILDREN EDUCATED IN TOTAL COMMUNICATION

Introduction

The C.I.D. Grammatical Analysis of Elicited Language-Simple Sentence Level is a measure of a child's language ability which has been standardized on orally trained, hearing-impaired children between the ages of 5 and 9 years old. This test has also been standardized on normally hearing children between the ages of 2½ and 5 years old.

The Grammatical Analysis of Elicited Language is administered to evaluate specific elements of spoken language. A structured situation is utilized to elicit specific target sentences which include language structures that develop relatively early in normal children. A set of toys, games, and activities are contrived to elicit the target sentences in which 16 grammatical categories are exemplified within the context of simple sentences. Scores are obtained in each of the following categories: Articles, Adjectives, Quantifiers, Demonstratives, Possessives, Conjunctions, Pronouns, Subject Nouns, Object Nouns, Wh-Question Words, Verbs, Verb Inflections, Copulas, Copula Inflections, Prepositions, and Negatives.

The child's response to the target sentences should reflect his best effort at producing that particular structure within the appropriate situation. The child is given two attempts to produce each sentence; first, prompted by the situation, and then imitated after the examiner has given the child a model. Prompted and imitated productions are scored separately. This helps to give an indication of the child's ability to produce a given

structure on his own and if improvement and/or learning can take place through imitation.

The purpose of this study is to determine the applicability of the C.I.D. GAEL Test-Simple Sentence Level to hearing-impaired children educated in a total communication setting. The following four hypotheses are examined.

1) a. The GAEL test is appropriate for children educated in total communication.
   b. The GAEL test can be reliably transcribed between transcribers.

2) It is predicted that the manual production will exceed the oral production of children who communicate in total communication.

3) The oral production of orally educated children will exceed the oral production of children who communicate in total communication.

4) a. The relative difficulty of grammatical structures for children enrolled in a total communication program will correlate significantly with that of children enrolled in oral programs.
   b. The relative difficulty of the manual production of grammatical structures for children enrolled in a total communication program will correlate significantly with their oral productions.
   c. The relative difficulty of the manual production of grammatical structures for children enrolled in a total communication program will correlate higher with productions of normal children than the oral production of children in a total communication program.

Method

Subjects

The subjects included eight severe to profoundly deaf hearing-impaired children, obtained from three different total communication programs including a school in St. Louis, Missouri, Illinois, and California. The sample consisted of four boys and four girls ranging in age from 5 years 5 months to 7 years 3 months. Hearing levels, using a 3-frequency average at 500, 1000, and 2000 Hz in the better ear, ranged from 78 dB to 110 dB with a mean pure-tone-average of 96.75 dB. (Refer to Table 1) All of the children used Signing Exact English as their signing system.

Total T-score

Child	Age (year, month)	Hearing loss: PTA dB left ear	Right ear	Prompted Production: Manual	Oral	Combined	Imitated Production: Manual	Oral	Combined
1	5.5	107 dB	100 dB	52.5	50	57.5	50	47.5	52.5
2	7.3	78 dB	100 dB	52.5	57.5	57.5	50	52.5	55
3	5.9	97 dB	95 dB	47.5	52.5	52.5	50	55	57.5
4	6.10	100 dB	90 dB	47.5	40	47.5	50	42.5	52.5
5	5.10	107 dB	105 dB	52.5	32.5	57.5	55	25	57.5
6	5.6	83 dB	92 dB	65	55	67.5	67.5	52.5	67.5
7	7.2	110 dB	110 dB	55	52.5	57.5	55	52.5	57.5
8	6.10	104 dB	103 dB	50	57.5	57.5	52.5	57.5	62.5
			$\bar{X}$	52.81	49.69	56.88	53.75	48.13	57.81
			S.D.	5.58	9.91	5.63	5.98	10.42	5.08

Table 1: Total Mean standard scores for prompted and imitated productions of each child. Total scores obtained in manual, oral, and combined productions.

Testing Procedure

The Grammatical Analysis of Elicted Language-Simple Sentence Level was administered to the eight subjects individually by a trained examiner, proficient in sign language. Each session was videotaped for better accuracy of transcriptions. Each subject's responses were transcribed twice from the videotapes; once, to obtain a transcription for the child's spoken production, and the second time, to obtain a transcription of the child's signed production. Utterances for each child were then scored and totaled to obtain a number correct score, percentile rank, and standard score as compared with the normative data for orally-educated 5-9 year old hearing-impaired children. Three different scores were recorded for each subject in order to attain a profile of his oral production, signed production, and combined production. The combined score was calculated by comparing the oral score sheet and manual score sheet. The transcriber looked at each target sentence, item by item. If an item was scored as correct through one mode but not the other, that item was scored as correct in the combined category. Therefore, the combined score resulted in the best production of both the spoken and manual productions.

Results

Hypothesis 1

The first hypothesis, involving the appropriateness of the GAEL test to children educated in total communication, was examined by computing the mean standard scores from the number correct for each grammatical category and for the total score in both the prompted and imitated portions of the test. The standard scores were derived from the normative tables of the GAEL. Table 1 illustrates the total standard score for each of the eight

Total T-score

	Prompted Production				Imitated Production	
Child	Manual	Oral	Combined	Combined	Manual	Oral
1	52.5	50	57.5	52.5	50	47.5
2	52.5	57.5	57.5	55	50	52.5
3	47.5	52.5	52.5	57.5	50	55
4	47.5	40	47.5	52.5	50	42.5
5	52.5	32.5	57.5	57.5	55	25
6	65	55	67.5	67.5	675	52.5
7	55	52.5	57.5	57.5	55	52.5
8	50	57.5	57.5	625	52.5	57.5
$\bar{X}$ =	52.81	49.69	56.88	57.81	53.75	48.13
S.D. =	5.58	8.91	5.63	5.08	5.98	10.42
t. =	.84		.35		1.32	

$^{+}$ $p \leq .05$

	Prompted Production				Imitated Production:			
n = 8	Manual	Combined	Oral	Combined	Manual	Combined	Oral	Combined
$\bar{X}$	52.81	56.88	49.69	56.88	53.75	57.81	48.13	57.81
S.D.	5.58	5.63	8.91	5.63	5.98	5.08	10.42	5.08
t =	1.45		1.93^{+}		1.47		2.37^{+}	

Table 2: Total t-scores of 8 children.

	Manual Production				Oral Production			
	Total Prompted		Total Imitated		Total Prompted		Total Imitated	
Children	L.J	B.S.	L.J.	B.S.	L.J.	J.m.	L.J.	J.m.
N=6								
$\bar{X}$	289.7	284.3	351.8	342.2	286.5	280.3	351.2	349.2
S.D.	62.8	59.7	65.8	60.3	43.2	52.6	63.7	72.4
r	.98		.99		.96		.97	

Table 3: Mean raw scores converted to a correlation coefficient utilizing a Pearson-Product-moment Correlation to indicate reliability of transcriptions between examiners.

subjects' manual production, oral production, and combined production within the prompted and imitated categories. These scores demonstrate that all of the children were able to produce some approximation of the target sentence. The mean total T-scores of Prompted production include: Manual - 52.8, Oral - 49.7, Combined - 56.9; Imitated production: Manual - 53.8, Oral -48.1, Combined - 57.8, which indicate that on the average, these subjects performed as well as the orally educated hearing-impaired children. For the orally trained hearing-impaired child, all T-scores between 40 and 60 were considered to be in the average range.

Six of the eight subjects were independently transcribed and scored by three different people in order to correlate reliability between transcribers. In order to determine a correlation of the manual production, the scores of a graduate student at Central Institute for the Deaf who had some knowledge of sign language were compared to the scores of a trained examiner who had given the GAEL to the subjects. In order to determine reliability for the oral production, the scores obtained by the graduate student were compared to scores obtained by one of the authors of the GAEL. The mean raw scores of the total prompted and imitated productions of the six subjects were converted to a correlation coefficient utilizing the Pearson-Product-Moment Correlation in order to show the relationship of the scores between transcribers. The reliability coefficients for the manual productions were .98 for prompted and .99 for the imitated portion. The reliability coefficients for the oral productions were .96 for prompted and .97 for the imitated portion of the test. These results are displayed in Table 3. Even though there was a small number of subjects sampled, the results give an indication that the GAEL can be reliably transcribed for children educated in total communication.

Hypothesis 2

In order to depict the differences in overall performance, as well as differences in a child's structural components of language between the three modes of production--Manual, Oral, and Combined--the total scores for each grammatical category were converted to T-scores. Table 2 illustrates a comparison of the differences in total T-scores between the different modes of communication in prompted and imitated portions of the test for all 8 children. Within the prompted production, a t of .84 was obtained by comparing calculations of the manual and oral scores. By comparing the combined prompted production and the combined imitated productions, a t of .35 was obtained. A t of 1.32 was obtained when the manual imitated production was compared with the oral imitated production. None of these differences were significant at the .05 level. However, a significant difference of 1.93 was found between oral and combined prompted productions and a significant t of 2.37 between oral and combined imitated productions (with a probability $\leq .05$). This indicates that the oral productions of the subjects were significantly poorer than their combined productions (or their best production of both the manual and oral categories). It was exhibited that the subject's manual production was not significantly better than their oral production in overall performance.

Figure 1 illustrates the mean standard scores of the prompted manual, oral, and combined scores across grammatical categories. The abscissa represents the mean standard scores, and the ordinate axis represents the 16 grammatical categories. The graph demonstrates that all three modes of productions follow a similar curve with the combined mode (red line) displaying higher scores than either the manual (green dotted line) or oral (blue line) modes of production. This graph also indicates a tendency

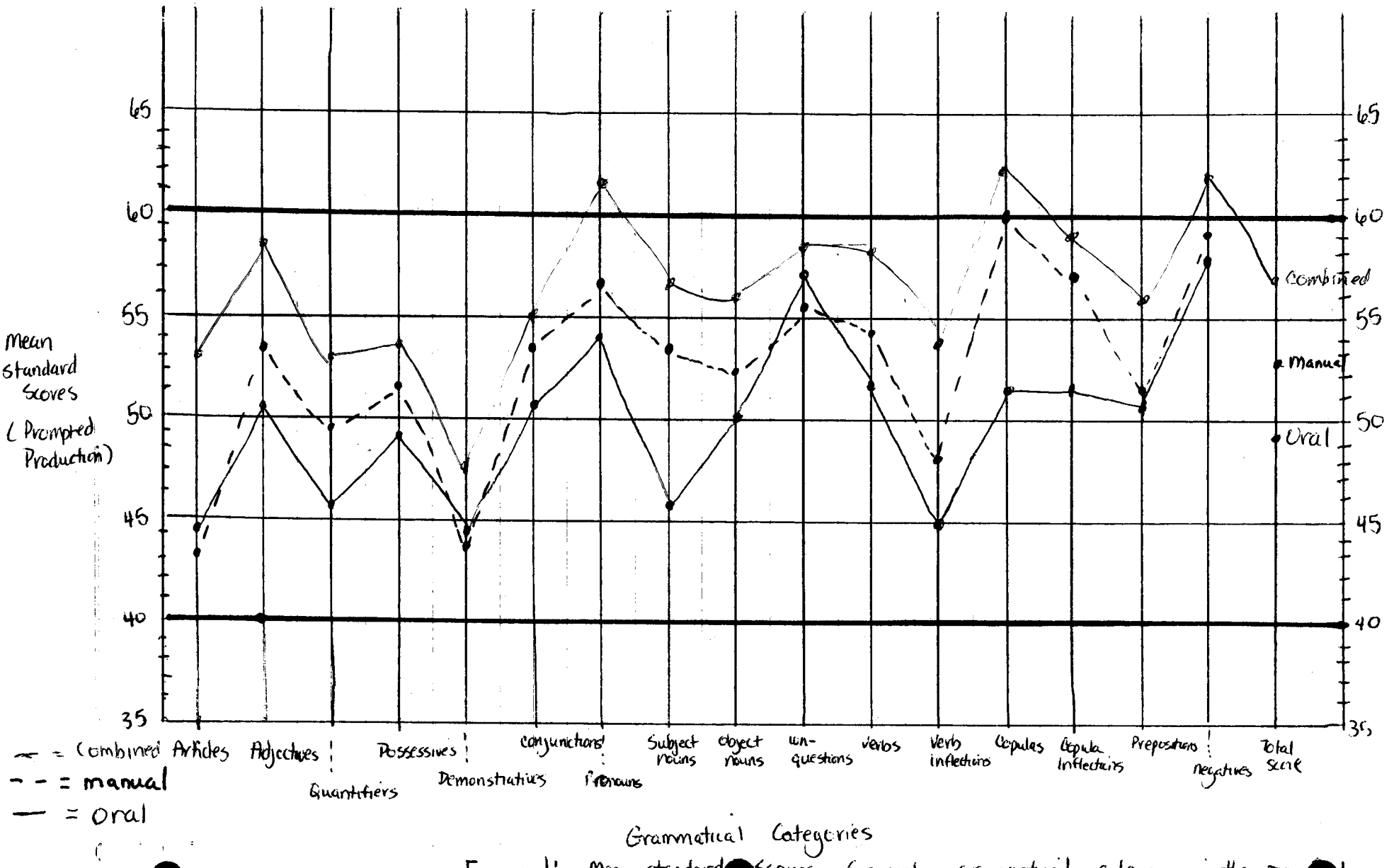

Figure 1: Mean standard scores for each grammatical category in the prompted production of manual, oral, and combined score sheets.

for the manual scores to show a slightly higher performance than the oral scores in most of the grammatical categories.

Table 4 illustrates the mean standard scores of all eight subjects for each grammatical category. T-scores were calculated to show significant differences, if any, between prompted oral and manual productions, imitated oral and manual productions, and prompted and imitated combined productions within each category. Significant differences were found at the .05 level for the following grammatical categories:

a) Adjectives - a significant t of 2.13 between prompted and imitated combined productions (df = 7).

b) Verb Inflections - a significant t of 2.20 between the imitated manual and oral productions (df = 7).

c) Copulas - a significant t of 1.96 between prompted oral and manual productions (df = 7).

d) Negatives - a significant t of 1.93 between prompted and imitated combined productions (df = 7).

Hypothesis 3

The graph in Figure 1 also indicates that the children educated in total communication perform as well as hearing-impaired children educated orally across grammatical categories. None of the grammatical categories drops below a score of 40. Pronouns, Copulas, and Negatives are above average in the combined mode.

Hypothesis 4

In order to determine the level of difficulty of grammatical categories within each communication mode (oral and manual), the raw scores of each grammatical category were converted to a percent correct score. (Refer to Table 6). Scores were averaged across all subjects for each grammatical category and were then rank ordered in terms of percent

Grammatical Categories

Table 4: Mean standard scores for each grammatical category for prompted and imitated productions ~~T~~-score utilized to compare manual, oral and combined productions.

+ $p \leq .05$

Grammatical Category:	n=8	Prompted Production: Manual	Prompted Production: Oral	Prompted Production: Combined	Imitated Production: Combined	Imitated Production: Manual	Imitated Production: Oral
Articles	$\bar{X}$	43.15	44.69	53.13	48.75	47.81	47.19
	S.D.	4.23	6.04	5.51	6.91	7.37	7.25
	t	.36		1.4		.17	
Adjectives	$\bar{X}$	53.75	50.31	58.44	52.50	49.44	42.5
	S.D.	4.43	10.13	4.42	6.55	5.50	17.01
	t	.98		2.13+		.94	
Quantifiers	$\bar{X}$	49.69	45.94	53.13	56.25	52.81	47.81
	S.D.	11.29	5.82	8.63	7.68	7.96	11.45
	t	.93		.77		1.01	
Possessives	$\bar{X}$	51.57	49.06	53.75	56.25	51.25	49.06
	S.D.	8.44	11.72	6.41	8.66	12.61	11.49
	t	.49		.66		.36	
Demonstratives	$\bar{X}$	43.75	44.38	47.19	55.31	47.81	48.75
	S.D.	9.82	4.58	9.68	8.39	10.22	9.82
	t	.16		1.80		.19	
Conjunctions	$\bar{X}$	53.75	50.94	55	51.25	49.07	46.56
	S.D.	8.35	9.16	8.35	11.65	10.52	11.57
	t	.64		.74		.45	
Pronouns	$\bar{X}$	56.57	54.06	61.88	57.19	51.56	50.31
	S.D.	9.81	12.95	6.91	5.42	6.26	14.30
	t	.44		1.51		.23	
Subject nouns	$\bar{X}$	53.75	45.94	56.25	57.19	52.50	45.28
	S.D.	9.45	16.14	8.02	.88	4.82	20.10
	t	1.18		.33		.99	

Grammatical Categories

Grammatical Category:	n=8	Prompted Production: Manual	Prompted Production: Oral	Imitated Production: Combined	Imitated Production: Combined	Imitated Production: Manual	Imitated Production: Oral
Object nouns	$\bar{X}$:	52.50	50.0	55.63	55.94	52.50	49.38
	S.D.	6.12	11.26	4.96	3.52	5.82	13.55
	t:	.55		.15		.60	
Wh-questions	$\bar{X}$	55.94	57.19	58.75	56.25	54.69	50.94
	S.D.	7.43	4.90	4.43	2.31	2.82	8.96
	t	.40		1.41		1.13	
Verbs	$\bar{X}$	54.69	51.88	58.13	55.63	56.25	47.81
	S.D.	5.08	9.14	3.72	5.94	4.82	19.57
	t	.76		1.01		1.18	
Verb Inflections	$\bar{X}$	48.44	45.0	53.75	58.75	55.63	43.44
	S.D.	9.81	6.12	9.64	12.10	14.38	6.26
	t	.84		.91		2.20+	
Copulas	$\bar{X}$	60.0	51.88	63.13	61.56	58.75	51.56
	S.D.	8.13	8.43	12.45	8.01	8.13	10.17
	t	1.96+		.30		1.56	
Copula Inflection	$\bar{X}$	57.19	51.88	59.38	59.69	57.81	51.25
	S.D.	7.61	8.43	6.91	7.25	6.74	9.54
	t	1.32		.09		1.59	
Prepositions	$\bar{X}$	51.88	50.94	55.63	56.56	52.19	50.63
	S.D.	7.65	5.97	7.04	8.34	10.13	8.63
	t	.27		.24		.33	
Negatives	$\bar{X}$	59.38	58.13	62.50	54.69	52.81	48.75
	S.D.	11.48	12.45	10.09	5.42	6.74	14.33
	t	.21		1.93+		.73	

+ $p \leq .05$

correct. Only the prompted scores were used with the idea that the imitated productions would result in a similar order. The oral and manual scores were ordered separately. It was assumed that the relative difficulty of the grammatical categories would be reflected in the percent correct score. The relative difficulty of the structures is not the same for most of the categories. However, adjectives, demonstratives, pronouns, subject nouns, object nouns, and verb inflections have the same relative difficulty for both manual and oral productions. Subjects exhibited the least amount of difficulty with subject nouns and object nouns for their oral productions and their manual productions. Subjects exhibited the greatest amount of difficulty with demonstratives and verb inflections in both modes of communication. All subjects exhibited a moderate amount of difficulty with adjectives and pronouns in their oral and manual productions.

Table 5 illustrates the relative difficulty of grammatical categories of the subjects educated in total communication as compared to orally educated hearing-impaired children and normal children re: GAEL-S manual. A Spearman Rank-Difference Correlation was calculated from the percent correct scores to measure the degree of association between the four categories of normal, oral-hearing impaired, oral production-total communication, manual production-total communication subjects. These results can be seen in Figure 2. As would be expected, the highest correlation was between the manual and oral productions of children enrolled in total communication programs (Spearman $r = .95$). The oral productions and manual productions of the grammatical categories for children in total communication programs correlated similarly to the orally educated hearing-impaired children (T.C. oral and oral-hearing

	Oral		Total Communication	
	Normal	Hearing Imp.	Oral	Manual
Normal		.56	.44	.41
Oral - Hearing Impaired			.84	.83
T.C. - Oral				.95
T.C. - Manual				

Figure 2: Spearman Rank-Difference correlation on relative difficulty of grammatical categories correlating normal, orally trained hearing impaired, total communication-oral, and total communication-manual scores.

	Oral	Total Communication	
Normal	Hearing Impaired	Manual	Oral
1. Object nouns	Subject nouns	subject nouns	subject nouns
2. verb	Object nouns	Object nouns	Object nouns
3. subject nouns	Verb	Verb	Wh-questions
4. Articles	Possessives	Possessives	Verbs
5. Prepositions	Wh- questions	Wh-questions	Possessives
6. Demonstratives	Adjectives	Negatives	Negatives
7. Pronouns	Quantifiers	Adjectives	Adjectives
8. Possessives	Articles	Pronouns	Pronouns
9. Negatives	Pronouns	Copulas	Conjunctions
10. Copulas	Negatives	Quantifiers	Prepositions
11. Adjectives	Demonstratives	Conjunctions	Quantifiers
12. Wh- Questions	Prepositions	Copula Inflections	Copulas
13. Copula Inflections	Conjunctions	Prepositions	Articles
14. Verb Inflections	Copulas	Articles	Copula Inflections
15. Conjunctions	Copula Inflections	Demonstratives	Demonstratives
16. Quantifiers	Verb Inflections	Verb Inflections	Verb Inflections

Table 5: Rank Order of the magnitude of the level of difficulty of each grammatical category between the different methods of communication (as determined by percent correct prompted production)

Table 6: Percent Correct - Prompted Production

Total raw scores for each child for each grammatical category were converted to percent correct scores. Means and standard deviations were derived for each category.

M = manual, O = oral; Subjects 1-8

Grammatical Category:		% correct $\bar{X}$	S.D.	Rank order of level of difficulty 1 = easiest; 16 = most difficult.
Articles	M	25.9	13.3	14
	O.	26.7	17.2	13
Adjectives	M.	62.5	8.3	7
	O.	55.4	20.6	7
Quantifiers	M.	44.1	25.8	10
	O.	35.3	14.1	11
Possessives	M.	70.3	21.1	4
	O.	64.1	27.9	5.5
Demonstratives	M.	18.8	28.8	15
	O.	18.8	16.5	15
Conjunctions	M.	43.7	29.5	11
	O.	35.4	28.8	9
Pronouns	m.	54.6	19.5	8
	O.	50.5	23.2	8
Subject nouns	m.	90.7	10.1	1
	O.	82.8	16.9	1
Object nouns	m.	78.5	11.1	2
	O.	74.4	21.1	2
Wh- Questions	m.	67.7	32.1	5
	O.	72.5	16.0	3
Verbs	m.	78.5	9.7	3
	O.	72.0	17.9	4
Verb Inflections	m.	9.0	9.4	16
	O.	6.8	6.9	16

		$\bar{X}$ %	S.D.	Rank Order
Copulas	M.	49.2	20.2	9
	O.	28.8	21.2	12
Copula Inflections	M.	39.9	18.7	12
	O.	26.2	19.1	14
Prepositions	M.	37.5	21.6	13
	O.	35.4	16.3	10
Negatives	M.	67.2	34.0	6
	O.	64.1	38.6	5.5

impaired--significant correlation of .84; T.C.-manual and oral-hearing impaired--significant correlation of .83). The normal subjects correlated higher with the orally educated hearing-impaired subjects than with the subjects enrolled in total communication programs. (Normal and oral-hearing impaired--significant correlation of .56; T.C.-oral and normal-correlation of .44; T.C.-manual and normal-correlation of .41) As can be seen in Figure 2, the relative difficulty of the production of grammatical structures for children enrolled in a total communication program did not correlate higher with the normally hearing group than the oral productions of children in a total communication program.

Table 5 demonstrates that object nouns, subject nouns, and verbs were most frequently correct for the four groups of normal, oral-hearing impaired, T.C.-manual, and T.C.-oral. Verb inflections were the most difficult for all the hearing-impaired groups, whereas quantifiers were most difficult for the normal group. Copula inflections were also relatively difficult for all four groups. Aside from these categories, the relative difficulty of other grammatical categories varied among groups.

Discussion

As would be expected, it was found that in both prompted and imitated portions of the test, subjects performed best in combined, then manual, then oral communication modes. This suggests that the combined productions were most like the manual productions, and that the subjects left out more grammatical structures in their oral productions. The combined prompted and imitated scores were significantly better than the oral prompted and imitated scores averaged across all subjects. This may imply that a combined mode aids in the intelligibility of oral language for those children educated in a total communication program. This

finding also suggests to the teacher in a total communication program that the oral language skills be made a greater emphasis in the learning of language. However, there were not many significant differences found between the oral productions and manual productions of the subjects within each grammatical category. This indicates a tendency for these children to produce the spoken structures similar to the signed structures. A significant difference in verb inflections showed a tendency for children to imitate the structure more often in their manual production than in their oral production. There was also a tendency for children to omit copulas more often in their prompted oral productions than in their prompted manual productions. Both of these structures, especially verb inflections, are relatively difficult to acquire. It may be that it is easier to acquire verb inflections and copulas through signs for the child enrolled in a total communication program.

According to the level of difficulty of grammatical categories, the production modes of total communication correlated the most significantly. The next most significant correlation was between the orally educated hearing-impaired subjects and the subjects educated in total communication programs. This may suggest that hearing-impaired children, whether enrolled in oral programs or total communication programs have similar facility or difficulty with language structures. It also appears that hearing-impaired children do not develop structures in the same way that normal children do. The easiest structures for normal children are also the easiest for hearing-impaired children: subject nouns, object nouns, verbs. However, after those grammatical categories were ordered, groups varied in level of difficulty. The normal children's scores correlated higher with the oral hearing-impaired group than either total communication

group. The manual-total communication group did not exhibit a higher correlation with the normal group than did the oral-total communication group. Therefore, it may be important to note that giving children a signing system may not lessen the language delay or decrease the differences in the development of language between the hearing-impaired child and the normal child.

Figure 1, which illustrates the curves for the average standard scores of the combined, manual, and oral production, suggests that the subject's language abilities are similar to orally educated hearing-impaired children. Even though the sample studied was small, the data suggests that it appears to be feasible to standardize the GAEL-S on children educated in total communication programs. These children do perform as well as orally educated hearing-impaired children by demonstrating that they were capable of producing the target structures well within the average range for oral-hearing-impaired children. Appropriateness of the GAEL-S can also be considered in view of the fact that transcribers displayed a high degree of reliability.

One of the problems that might be foreseen in applying the GAEL to children educated in total communication would be how to evaluate a child's total facility with language if he is more competent with one mode of communication than the other.

However, if the Grammatical Analysis of Elicited Language could be used as an effective tool to evaluate a child educated in T.C.'s language, a comparison of the total communication child's language with other hearing-impaired children, as well as with the normal child, could be made. This would allow the evaluater to determine how a particular child is developing language appropriately as compared to other hearing-impaired children.

The GAEL could also be used as a tool to aid in the planning of language instruction as far as determining what structures a child is missing or needs further emphasis on.

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