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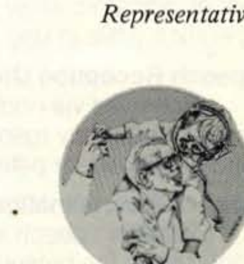
articles

features

cover

Adults who care helping children who need. That's what much of the work in this field is all about. A celebration of love successfully communicated, conceived and executed by Los Angeles illustrator Howard Goldstein.



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The Deaf Child's Learning of English Morphology

The deaf child is unable to learn and practise linguistic rules in a manner similar to the normally hearing child. While residual hearing may provide auditory reception of amplified spoken signals, this reception is faulty at best. To assist the deaf child in learning language rules, two major language teaching methods have been devised. Both of these, the natural system,[8, 14] and the formal system,[5, 2] rely extensively on visual presentation of materials. Both may be taught utilizing one or more of speechreading, speech, reading, writing, fingerspelling and sign language systems.

Many deaf children are not exposed to language patterns until the age of five or six years when they enter formal education. Then the child is introduced by means of one of the two main language teaching methods to language rules in a rather stereotyped fashion. Lenneberg[10] asserted that these methods present "a metalanguage, a language about the language which they (deaf children) do not yet have (p. 322)." He questioned whether these meta-language methodologies coupled with the large-scale deficiency in model examples occasioned by hearing impairment, would ever result in normal language ability in the deaf population. Research demonstrates that, in fact, the average deaf child does not acquire the language facility of his normally hearing peer.[15, 7, 11] However, past language investigations have been limited in usefulness due to generality and subjectivity.

One specific language area which has been examined in recent years is that of the deaf child's ability to deal with morphological rules. Studies in this area have followed Berko's model.[1] Berko "set out to discover what is learned by children exposed to English morphology (1958, p. 13)." She theorized that one could discover whether a normally hearing child had internalized a morphological rule by requiring him to inflect nonsense words. If the child generalized the correct morphological form from English to the nonsense word, it could be concluded that the rule was internalized. Berko found that by age seven children possessed a good grasp of the rules for the most common morphological inflections and a fair grasp of the rules for the less common inflections. Children did not react to new words with unique, individual responses. There was definite evidence of a common, shared grammar.

Garber[6] and Cooper[4] transposed Berko's theory to the study of morpho-

Table I: Berko's Test of Morphological Rules: Selected Items and Error Source.

Item	Error Source	Item	Error Source
1. This is a wug. Now there is another one. There are two of them. There are two ________. Similarly for items: 2. gutch; 4. kazh; 7. tor; 9.4 lun; 10. niz; 12. cra; 13. tass; 17. heaf; 18. glass.	plural form	4. This is a nizz who owns a hat. Whose hat is it? It is the ________ hat.	possessive singular form
		Now there are two nizzes. They both own hats. Whose hats are they? They are the ________ hats. Similarly for items: 23. wug; 26. bik.	possessive plural form
2. This is a man who knows how to spow. He is spowing. He did the same thing yesterday. What did he do yesterday? Yesterday he ________. Similarly for items: 5. rick; 11. mot; 14. bod; 19. gling; 20. bing; 23. ring.	past tense form	5. This is a man who knows how to zib. What is he doing? He is ________.	present progressive form
		6. This is an ice cube. Ice melts. It is melting. Now it is all gone. What happened to it? It ________.	past tense form
3. This is a man who knows how to naz. He is nazzing. He does it every day. Everyday he ________. Similarly for item: 20. loodge.	third person singular present tense form		

logical abilities in deaf children. Garber applied a modified Berko test and an analogous real word test to deaf and hearing children. His basic finding was that his 45 deaf subjects (CA range 6.7 to 13.6) lagged in the acquisition of morphological rules when compared to his 45 hearing subjects (CA range 5.6 to 8.6). He concluded that this lag was due in part to their highly structured school environment, the ineffectiveness of parents in providing experiences and the inadequacy of teaching methods.

Cooper used a Berko-type task in an attempt to create a test of deaf children's linguistic competence. He tested receptive and productive control of inflectional and derivational suffixes in a 48 item test. His subjects were deaf seven to 19 year olds and hearing second, fourth and sixth graders. The deaf subjects obtained much lower scores than did the hearing subjects but paralleled them in the development of morphological patterns. From this study and a later one with Kaye[4], Cooper concluded that deaf children and hearing children share "universal" grammatical rules. The deaf subject's grammar was different in terms of a few superficial rules or, if the grammars were actually similar, appeared different on the performance level due to different rules for performance.

Both Cooper and Garber committed the same major methodological error not found in Berko's original study. Berko allowed her subjects to give any response they wished. Cooper and Garber limited their subjects to three or four possible responses respectively. These responses were pre-determined by the investigators and reflect their beliefs regarding the possible range of responses. Such a limitation was not suggested in the research questions posed by the two investigators.

Purpose. This study was conducted to investigate the ability of deaf subjects to demonstrate productive use of selected basic morphological rules. Variables of interest were language teaching method, sex and age.

Method. *Subjects.* Subjects were selected from a residential school for the deaf which employed the natural method of teaching language and a residential school for the deaf emphasizing more formalized methods of teaching language. Subjects were divided by age groups (A_1, 9.0 to 10.11; A_2, 12.0 to 13.11; A_3, 15.0 to 16.11), language teaching method and sex. All subjects had an average puretone hearing loss of at least 80 dB (A.N.S.I.) in the better ear over 500, 1000 and 2000 Hz., a tested Wechsler Intelligence Scale for Children performance scale I.Q. level between 85 and 115 and had experienced onset of deafness during the pre- or perinatal stage as indicated by school records. Children classified by administrators and teachers as multihandicapped were excluded.

Instrumentation. Berko's *Test of Morphological Rules* was modified shown in *Table I.* Selected items were administered in the sequence used by Berko. Berko items dealing with adjectival inflection, derivation and compounding were not selected. These items were excluded since there were insufficient exemplars for analysis and since some of the younger children had not been introduced to these forms in the instructional setting.

Administration and Design. Subjects were administered the test in groups of six to eight. Written instructions were displayed on an overhead screen and also conveyed using simultaneous speech and signing/fingerspelling. Each test was presented in a similar fashion. Fill-the-gap written responses were recorded by each subject on forms which contained the full text for each item (see Items, *Table I*). Scheduling was arranged so that subjects did not have opportunity to discuss test items with one another.

Scoring was on a correct (1) or incorrect (0) basis.

Analysis of results was effected by 2 x 3 x 2 (method x age x sex) analysis of variance. Bonferroni *t* (Kirk, 1968) tests were employed to trace sources of variation for main and interaction effects. An alpha level of .05 was selected for all analyses.

Results. Statistical analyses indicated that no significant main effect differences existed for language teaching method or sex for total items tested, noun items alone, verb items alone, or possessive items alone. Interaction effects involving method and sex were found only in the analysis for possessive items. The source of variation lay between males and females taught by the natural language method.

Age Differences: Total Items. Significant main effect differences were found for age in each analysis. In addition, a significant method x age interaction was found in the analysis for possessive forms. In the first three analyses (total, noun, and verb items) the source of variation lay between A_1 and A_2 and A_1 and A_3 groups. In the last case (possessives) the source of variation for main effect lay between the A_1 and A_3 groups (*Figure 1*). The interaction source of variation lay between the youngest natural method group and the oldest formal method group. In all cases the older groups obtained the higher scores.

Items were ordered according to grammatical form for analysis and discussion. *Table 2* expresses the number of totally correct responses to individual items by the subjects of each age group. The significant differences between the youngest group and the two older groups are clear.

Age Differences: Plural Items. In general deaf children 9 to 11 years of age do not possess automatic use of the plural forms *-s* and *-es*. Approximately one in three of the deaf children aged 12 to 17 is able to respond correctly to plural items in *-s* but within this group a degree of inconsistency of response exists. Roughly one in six of these older children responds correctly to plural items in *-es* but again inconsistency in response pattern is evident.

Three points regarding plural items merit further discussion here. Deaf children in this study did not respond to Berko items with the facility of much younger hearing children or the deaf children in the Garber study (*Table III*). A few older deaf children responded with a fair degree of correctness to plural *-s* and *-es* items, but among those few there were individuals who responded correctly and then incorrectly to items of exactly the same type. Lastly the one real word plural item (glasses) received more correct

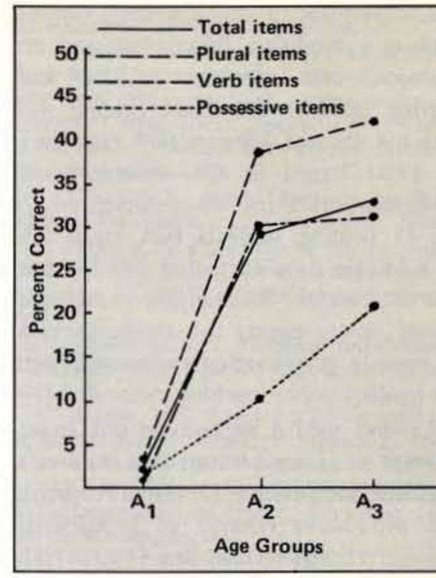

Figure 1: Percentage of correct responses to Berko Test of Morphological Rules items.

Table II: Number of Totally Correct Responses to Berko Test of Morphological Rules Items by A_1, A_2 and A_3 Age Group Subjects.

Item	A_1	A_2**	A_3***
1. wugs		10	7
2. tors	1	7	4
3. luns	1	10	8
4. cras		9	7
5. heafs/heaves		10	6
6. gutches		2	4
7. kazhes		4	4
8. nizzes		4	3
9. tasses		6	7
10. glasses		15	10
11. spowed		10	6
12. ricked		11	8
13. motted		7	6
14. bodded		9	7
15. melted		5	4
16. glinged/glang		9	6
17. binged/bang		7	5
18. ringed/rang		13	11
19. zibbing		6	4
20. loodges		5	2
21. nazzes		1	2
22. wug's		3	6
23. bik's		3	5
24. nizz's		4	3
25. wugs'		1	1
26. biks'			1
27. nizzes'	1		1
Totals	3	171	138

* n = 26 ** n = 28 *** n = 21

Table III: Percentage of Subjects Responding Correctly to Stimulus Items from Berko's Test of Morphological Rules.

Item	Berko (4-7 years)	Garber (6-13.6 years)	Present (9-16.11 years)
1. wugs	91	87	24
2. tors	85	76	15
3. luns	86	73	24
4. cras	79	71	20
5. heafs/heaves	82	22	20
6. gutches	36	27	9
7. kazhes	31	73	11
8. nizzes	28	82	9
9. tasses	36	73	17
10. glasses	91	76	33
11. spowed	52	82	21
12. ricked	73	80	24
13. motted	33	84	17
14. bodded	31	44	21
15. melted	73	38	24
16. glinged/glang	77	57	20
17. binged/bang	78	65	16
18. ringed/rang	17	44	32
19. zibbing	90	73	27
20. loodges	56	40	9
21. nazzes	48	29	8
22. wug's	84	56	24
23. bik's	87	62	11
24. nizz's	49	73	9
25. wugs'	88	**	5
26. biks'	93	**	3
27. nizzes'	76	**	5

**not recorded

responses than the nonsense word items in *-es*. Of the 49 older subjects, 25 responded correctly to "glasses" while an average of 8.5 responded correctly to the other plural *-es* items.

Age Differences: Verb Items. Once again 9- and 10-year-old deaf children do not appear to possess automatic use of the past tense form *-ed*, the present progressive verb form *-ing*, the third person singular verb form *-es* or the irregular past tense form of words such as "ring". Approximately one in three of both older groups responded correctly to nonsense words requiring an *-ed* ending. Twenty percent responded correctly to the present progressive form *-ing* while 10 percent correctly used the third person singular verb form *-es*.

The same three characteristics found in response to plural items were found for verb items. Subjects responded with less success to all items than did Berko or Garber subjects. Subjects responded with inconsistency to items ending in *-ed, -es* and in the irregular past form. Of the 49 older subjects, 13 responded with the form "rang" as the past tense of "ring". No subject responded with the form "glang" or "bang" as a past tense for "gling" and "bing" respectively.

Age Differences: Possessive Items. As with the previous two general cases, younger deaf subjects demonstrated an almost total lack of ability to handle possessive *-'s* and *-s'* or *-es'* forms. Approximately one in five older subjects responded appropriately to possessive singular forms in *-'s*. Only three percent demonstrated ability to respond appropriately to plural possessive forms in *-s'* or *-es'*.

Discussion. When compared to Berko's young hearing subjects, deaf children lag in the production of morphological rules. However, the phonemic lag is much more serious than Garber reported. The same comment holds for Cooper's conclusions though it is difficult to comment on his total analysis of linguistic abilities since he conducted more than one study in the area and investigated more than morphological rules. It does appear safe to suggest that investigators cannot assume, as did Cooper, that deaf and hearing children share "universal" rules with the deaf having superficial deviations. Only a limited number of the deaf subjects in this study exhibited correct use of rules considered "universal" among younger hearing children.

Both Berko and Garber presented their findings in the form of percentage of children correctly responding to items. *Table 3* summarizes these findings and the responses for this study. It is obvious that subjects in our study demonstrated far less ability to add correct suffixes than did those in the Berko or Garber studies.

That Garber and Cooper severely limited the possible responses of their subjects is evident from responses to Berko items. On the average a different response was suggested by every second or third subject. A_2 and A_3 subjects were considerably more varied in response than were A_1 subjects who preferred to repeat the stimulus item or not respond at all.

Certain groups of subjects of all ages under both teaching methods appeared unable to respond correctly to all or almost all Berko items. Other subjects in the A_2 and A_3 age groups responded correctly to nearly all items while others corrected half or more. All A_1 subjects demonstrated inability to deal with the items.

It would be simple to dismiss the universal lack of ability among the youngest subjects as a result of inappropriateness of test materials or instruction. Yet a few subjects do respond with perfect scores for one or two items while others demonstrate varying degrees of familiarity with the rules being examined. In addition, teachers reported that all language principles utilized in the test had been presented to all subjects and reviewed regularly. The fact that subjects did correct or attempt to respond to items indicates that most understood the instruction. Certainly all words and language constructions were familiar to the subjects. In addition all instructions were presented in sign language with which the subjects were familiar.

It is even more difficult to suggest reasons why so many older subjects obtain minimal scores while a limited number deal easily with the majority of items. Attempts were made to group the subjects into low-high scoring groups for statistical comparison on the variable of hearing, intelligence, and etiology. Age and sex comparisons had already been made. Unfortunately a number of difficulties arose. Etiology was not suitable as a variable since approximately half of the subjects fell in the unknown etiology category. In addition the set of test scores did not reveal a plateau where a logical break into low-high groups was possible. At this time, given the available information, a definite explanation cannot be offered. One definite statement can be made however. This phenomenon occurs under both language teaching methodologies.

Two aspects of response to Berko items stand out. One is that some items received more correct responses than other exemplars of their type. This occurred despite the fact that these other exemplars were similar in every way except for the stimulus picture and word. It is obvious that subjects responded inconsistently to similar items requiring demonstration of the same rule. One explanation for this interesting inconsistency would be that some subjects were applying the rules on some basis other than internalization.

The possibility that individual real word items might be memorized by hearing impaired children must be considered when the real word items "glasses" and "rang" are examined. Though these items are formed using the same rules as their exemplars, they stand out as being corrected at a much higher level. The one likely explanation is that some subjects recalled the forms of these specific words from prior experience and responded to them in a case by case manner. Such an argument would explain many of the response patterns or lack of pattern in response. The Berko argument in favour of an internalization position for hearing children as a result of her studies, argues for a case by case position for the deaf subjects in our study. One cannot assume all deaf children are memorizing specific items rather than internalizing grammatical rules. The ability of some deaf subjects to respond correctly to most stimulus items indicates fairly sophisticated performance levels. At the same time internalization cannot be assumed. The total or almost total incompetence of the majority of deaf subjects in responding to Berko items would not permit such an assumption.

Conclusion. The existing knowledge regarding the deaf child's learning of English morphology appears suspect. This study suggests that it is not until age 12 that a degree of ability to respond with correct morphological rules in a nonsense

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THE DEAF CHILDS' *continued from page 16*

word situation is demonstrated by a limited number of deaf children. From age 12 to 17 little additional development of this ability is apparent.

Despite claims by their supporters, neither the formal language teaching method nor the natural language teaching method enables the deaf child to use the morphological rules examined in our study at a higher level than the other. No significant difference was found on the basis of language method on the items examined in this study.

Two definite ability groups emerge among 12- to 17-year-old deaf children. The first and larger group demonstrates almost total, or total, inability to respond correctly to common morphological rules. The second and smaller group demonstrates considerable morphological ability. Within this second group, however, individuals are inconsistent in dealing with morphological items of exactly the same type. There is evidence of some subjects being able to deal with a number of common rules examined but not others. Thus some deaf subjects 12 to 17 years of age appear to share "universal" rules with hearing children but a majority do not.

It is not possible to state definitely whether deaf children do or do not internalize common English morphological rules. The results of this study call into question previous findings. Further experimentation using real word and nonsense word items will be required before this complex area begins to be clarified.

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BRAIN-STEM *continued from page 20*

as an index of abnormality. The most appropriate response measure, however, is still under investigation.

Brain-Stem Site. Brain-stem disorders may affect both the latency and the waveform of the evoked potentials. Although wave V is usually the most prominent wave, inspection of the overall form of the evoked potentials increases the diagnostic value of BSER. Any of the component waves, but especially waves IV and V, may be selectively distorted, delayed or absent. Furthermore, these alterations can be observed in the presence of virtually normal pure tone sensitivity.

In *Figure 4* the first patient (brainstem A) had a glioma at the level of the fourth ventricle with some extension into the thalamus. Although pure tone sensitivity was within normal limits on both ears, the waveforms from the two ears were radically different. The BSER response from the left ear shows a normal waveform, but the response from the right ear shows only waves I through III.

Because of the sensitivity of BSER to the physiological state of the brain-stem, BSER audiometry can be used to monitor recovery or improvement of brain-stem disorders. The second patient illustrated in *Figure 4* (brain-stem B) had been followed by our audiology service for one year during the course of irradiation of a left paramedian medulloblastoma of the left inferior cerebellar hemisphere. During the course of treatment, increased cerebrospinal fluid pressure developed. Prior to placement of a ventriculo peritoneal shunt, to relieve this pressure, BSER responses were observed from the right ear at normal latencies, but BSER responses could not be elicited from the left ear at any click intensity (*Figure 4*, preshunt). Post-operatively (*Figure 4*, post-shunt) waves I through V were apparent in the response from both ears. The latencies of waves IV and V were delayed, however, on the left ear. Note that while there is a dramatic change in the BSER waveform on the left ear, there is essentially no change in pure tone sensitivity.

On both patients gross abnormalities in the BSER waveform are evident in the face of no more than a mild sensitivity loss in the affected ear.

Summary. Brain-stem evoked response audiometry adds a new dimension to the audiologic evaluation of patients with neuro-otologic disorders. Examination of the pattern of the various waves, and especially the latency of wave V, provides valuable diagnostic information. Cochlear disorders show a normal waveform and only slightly delayed latencies. In eighth nerve disorders, however, wave V may be delayed, distorted, or absent even when sensitivity loss is mild. In patients with brain-stem lesions, some component waves may be absent or greatly delayed, resulting in a grossly abnormal waveform.

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