DOCUMENT RESUME

ED 246 562 EC 162 750

AUTHOR Hirsh-Pasek, Kathy
TITLE What Second Generation Deaf Students Bring to the Reading Task: Another Case for Metalinguistics and Reading.
SPONS AGENCY Rutgers, The State Univ., New Brunswick, N.J. School of Medicine.
PUB DATE Oct 82
GRANT HD-12278-03
NOTE 27p.; Portions of this research were presented at the Annual Boston University Conference on Language Development (7th, Boston, MA, October 8-10, 1982).
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Deafness; *Decoding (Reading); Elementary Secondary Education; *Finger Spelling; Manual Communication; *Reading

ABSTRACT

Twenty-five second generation deaf signers (6-16 years old) participated in three experiments measuring their ability to classify fingerspelled and signed words and attend to the individual handshapes within fingerspelled words. Results revealed that Ss could discriminate fingerspelled words and decompose fingerspelling into the handshapes that map into English orthography. Even the youngest Ss demonstrated full metalinguistic competence in these tasks. Findings suggest that there is a possible link between the signer's natural language and reading, and that deaf Ss have the ability to capitalize on this link. The link may help them decode words into fingerspelling in the same way spoken language allows decoding into sound. (CL)

What second generation deaf students bring to the reading task: Another case for metalinguistics and reading.

Kathy Hirsh-Pasek

Swarthmore College

&

CMDNJ-Rutgers Medical School

Running head: What second generation deaf students bring to the reading task

Acknowledgments: I would like to thank April Nelson, my informant, Sue Leviton, my consultant and Anna Steckle, my interpreter, for the many hours that they spent introducing me to ASL and the deaf culture. The teachers, staff and students at both the Millbourn School for the Deaf in New Jersey and the Pennsylvania School for the Deaf were most generous with their time. Drs. Lila Gleitman, Henry Gleitman and Elizabeth Shipley provided constructive criticisms throughout the work. Finally, Drs. Rebecca Treiman, Leslie Rescorla and Jeffrey Pasek offered helpful comments on earlier drafts of this paper. Portions of this research were presented at the Boston Language Conference, Boston, Mass., October 9, 1982. The paper was funded, in part, by a grant to CMDNJ-Rutgers Medical School #HD-12278-03.

Send proofs to Kathy Hirsh-Pasek, Psychology Department, Swarthmore College, Swarthmore, PA 19081.

Abstract

To deaf students alphabetic print must seem like squiggles from a foreign language. Yet, one part of the signer's native vocabulary--fingerspellng--is directly represented in the print. If deaf students can recruit and utilize that aspect of their lexicon they may find a natural inroad to English orthography. This reseach focuses on the deaf student's ability to attend to the fingerspelled lexicon within his language. Twenty-five second generation deaf signers participated in three experiments that tapped their competence (1) in classifying fingerspelled and signed words; and (2) in attending to the individual handshapes within fingerspelled words--the handshapes that are directly coded in the orthography. Even the youngest subjects (ages 6-11) demonstrated full metalinguistic competence in these tasks. Further, their metalinguistic competence shows a specific relationship to reading comprehension and not to other measures of intellectual functioning. Presumably, they can use these skills, that they bring to the reading task, to assist them in identifying printed vocabulary and in subsequently increasing their reading comprehension scores.

In his original novel entitled Tarzan of the Apes, Edgar Rice Burroughs (1914) introduces the jungle boy Tarzan.

Tarzan learned to speak French. Yet, he taught himself to read and write in English: a language that he had never encountered outside of print. Congenitally deaf individuals seem to face a similar situation when they approach the reading task. They must learn to read alphabetic print without the advantage of learning the corresponding spoken language. For some congentially deaf individuals, however, the link between their primary language and English orthography is not as remote as it might otherwise appear. For those who use American Sign Language (ASL), there exists a direct link to the alphabet through that subcomponent of their lexicon that is represented in fingerspelling.

Fingerspelled words are words that originate in the English language and are literally spelled, letter by letter with corresponding handshapes. They emerge in a number of different contexts within the language. Most proper nouns, for example, are represented through fingerspelling. Fingerspelled words also emerge when there is no existant sign for some concept as is the case for many technical terms. Fingerspelling is used acronymically where initial handshapes help to differentiate similarly made, closely related signs. Thus an F-handshape denotes the sign family while a C-handshape is used for the similarly made sign class. It also surfaces in loan or borrowed signs where frequently used English words become so ingrained in the language that they undergo morphological changes that render them sign-like in appearance (Battison, 1978). Words like J-O-B, A-L-L and D-O-G, for example, are all comprised of handshapes that map one to one onto the English alphabet though they look much like signed words. Finally, deaf individuals use fingerspelling as a default option when communicating with someone who doesn't know a sign for a particular word. Examples of fingerspelling as it is used in the above contexts are represented in Figure 1.

Insert Figure 1 about here

Deaf people generally know more signs than fingerspelled words and prefer to use signs when they are available. Yet, they often accumulate sizable fingerspelled vocabularies. When deaf individuals process these fingerspelled words, they do not perceive them as strings of disjointed or discrete letters. Rather, they perceive the words as meaningful wholes or they perceive the morphologically meaningful subparts of the words within their lexicon (Blasdell & Caccamise, 1976). Thus, through fingerspelling, there exists one critical link between what signers bring to the task and the print that they are asked to decifer. If deaf people can be made aware of their fingerspelled lexicon, can build upon it, access it and can compare it to written forms, they might be able to establish a means for increasing their written vocabularies. They might be able to convert or decode printed words into the more familiar fingerspelled words that have direct meaning in their language.

This research asks what deaf children know about the fingerspelled component of their language in an effort to assess whether they are capable of profiting from the links that exist between script and hand. Two questions about fingerspelling are posed. First, can deaf students reliably distinguish between fingerspelled and signed words in their lexicon? Children learn fingerspelled and signed words simultaneously--as part of fluent language input. Yet, only for fingerspelled words (not for signs) is there a direct relationship between print and language. Second, can deaf individuals separately identify individual handshapes within fingerspelled words from the fluent stream of handshapes that they naturally perceive? These two prerequisite abilities of word type classification and handshape abstraction were tested in the context of three experiments. To anticipate the results of these experiments, deaf students are very competent metalinguists who are consistent in their ability to both access and manipulate that subcomponent of their language that could assist them in learning to read.

General Method

Subjects. The subjects for the three experiments were chosen from a pool of 25 congenitally deaf students--all of whom attended center schools for the deaf. Though total communication was used in the school systems, all of these children came from homes where the primary language was American Sign Language.

The constraint imposed by choosing second generation native signers, who are approximately 10% of the deaf population forced acceptance of subjects who varied in age from 6-16 years. Of the 25 subjects in this range, 13 were within the elementary school ages of 6 to 11 years and results from this younger group will be reported separately. Despite the rather large age differential, however, these subjects did not vary widely on the critical variables of native language and reading level. The fact that all of the students used sign language increased the probability that they had a number of fingerspelled words in their working vocabularies. It also decreased the chance that these individuals would be burdened with emotional problems that often accompany the lack of a first language. The subjects were further constrained in that their reading levels were concentrated between the 1st and 3rd grade levels as measured on the reading comprehension subpart of the Stanford Achivement test normed on hearing impaired students. Only 6 of the students read at a level beyond 3rd grade: at a level that reflects comprehension rather than mere decoding of print. Finally, all of the students were of average intelligence as assessed on performance subparts of the WISC, Merrill-Palmer and WPPSI intellience tests.

General Procedure

The students were individually tested in their respective schools. A certified interpreter who is herself a native signer of ASL assisted in administering all of the experiments. When stimuli were presented on the video monitor, the interpreter also functioned as a video performer. This helped to motivate the students who thought that they were priveleged in meeting a television star.

Word Classification: Experiment 1

The first experiment was designed to investigate whether students could reliably distinguish between the signed and fingerspelled words in their vocabularies. It is important to remember that these two word types co-exit for signers in the same way that German-derived words like Gesuntite and French derived words like cafe coexist in our spoken language. Note also the evidence reporting that deaf individuals do not perceive fingerspelled words as series of discrete handshapes, but rather as perceivable wholes. This suggests that they do not see fingerspelling in the way that we hear words spelled in a spelling bee. Rather they might see two types of words where the first is pronounced Seeatee and the second cat. Given these qualifications, it becomes of interest to ask whether deaf individuals can distinguish those words that are directly represented in print from those that are not.

A number of discriminating features may assist the students in classifying the two word types. Fingerspelled words, for example, are generally made on one hand positioned to the right or left of the cheek with handshapes articulated with rhythmic consistency. Signs on the other hand can (1) use either one or two hands, (2) vary in place of articulation, and (3) go beyond mere handshape representation to vary delivery on parameters like movement, direction and orientation. Figure 2 depicts the major differences in sign and fingerspelling representation. If deaf individuals are sensitive to these production differences, they should--at minimum--be able to consistently classify those words that do relate to print from those that do not.

Insert Figure 2 about here

Method

Procedure. This classification ability was tested in a simple sorting task. Twenty unfamiliar fingerspelled and signed words were serially presented to the children on a video monitor. The unfamiliar fingerspelled words were infrequently used technical terms like ION, QUARTZ, etc. The unfamiliar signed words--or nonsense signs--were drawn from Israeli signs that were possible American signs. They were single hand signs that matched the fingerspelled words in duration on the screen. Also included in the stimulus set were seven loan or borrowed signs. Those are words like DOG, HA-HA, and JOB that are derived from fingerspelling but which have undergone morphological changes that make them sign-like in appearance. Twenty- one students participated in the task. Four could not participate due to equipment failure. First the subjects engaged in a live demonstration where signed words were paired with red chips and fingerspelled words with black chips. Subjects then participated in a one minute training tape where they were asked to sort randomly presented, unfamiliar words into the red or black pile with feedback provided for every incorrect response. Finally, the students engaged in the actual test where they were requsted to (1) place a red or black chip in the box for every word that appeared on the screen and, (2) to try to determine the nature of the classification system that they were using. The independent variable was the word type. The dependent variables were correct or incorrect responses to the word types.

Results and Discussion

The results from this experiment are presented in Table 1. The evidence clearly suggests that subjects could reliably distinguish fingerspelled from signed words, correctly classifying signs 95% of the time and fingerspelling 99% of the time. All but one student, a 6-year old, correctly explained the nature of the classification system being used. Given that they knew none of thse words; one can conclude that they understood the rule system underlying production and reception of these words. Perhaps most interesting is the fact that simple visual-perceptual characteristics cannot account for this difference since 94% of the loan words, that look like signed words, were correctly identified as fingerspelling. The fact that students were responding at ceiling on the task suggests that they are cognizant of the two types of lexical items that comprise their mental dictionary. The ability to discriminate these word types means that they can identify and presumably access just the class of fingerspelled words if they are to be used in relation to reading tasks.

Handshape Abstraction: Experiments 2 & 3

Accessibility of fingerspelled words as a class is necessary, but not sufficient for relating print to language. For example, one could memorize the paired association between an entire printed word and its fingerspelled gloss just as he memorizes print-sign word pairs. The key to productive decoding through fingerspelling comes from attention to the individual handshapes within the fingerspelled word: the handshapes that map directly onto alphabetic letters. Thus the next two experiments focus on the deaf student's ability (1) to recognize individual handshapes within fluently presented fingerspelled words and (2) to manipulate individual handshapes within those words. These experiments are analagous to those that ask whether hearing readers can segment spoken words into phonemes before they are exposed to the alphabetic principle that facilitates that segmentation.

Experiment 2

Method

Procedure. The first of the segmentation experiments, the recognition test, was an adaptation of the phoneme monitor tasks used by Foss (1969, 1970, 1975). Twenty of the same subjects who participated in the classification task served as subjects in this task.

Each child was seated in front of the video monitor and was told that he was to be a detective on the look-out for particular handshapes. He was handed a small mechanical box and was instructed to press the lever on the box as soon as a designated handshape appeared on the screen. Pressing the lever simultaneously enacted a small red light located at the top center of the video monitor to provide visual feedback and a crisp buzzer noise that was audio recorded onto the test tape to measure reaction time. For example, the subjects would see a prerecorded trial tape on which they received general instructions followed by practice rounds on particular stimuli. A sequence might go like this, "Look for the B, Look for the B" after which the student would see either the fingerspelled word B-L-U-E where the B handshape appears in the 1st letter position or a matched signed sentence Brown-Dogs-are Beautiful, where the B handshape surfaces in the 1st position as the signed word BROWN. Another example might be, "Look for the V. Look for the V" followed by either the sentence I-want-two-oranges or the spelled word H-A-V-E. Here the V handshape is perceivable as the third handshape in both members of the pair: the word "two" and the letter V. Both of these examples are graphically depicted in Figure 3. The analogous study using sound would present subjects with a spelled word B-A-C-K and a sentence "Did you see Rick" where the target sound "C" appears in the third position. Once the subjects understood the instructions and the format of the test, the actual test tape was presented. These subjects received 20 matched signed/fingerspelled pairs. Each stimulus was treated independently with signed sentences appearing first in half of the instances and fingerspelled words occurring first in the other half of the examples. Target letters were varied across four positions within the word or sentence, the handshapes were equally visible in both conditions and the exposure of each handshape on the screen was controlled by presenting letters and signs at regular signing speed with intra word and sentence handshape changes regulated by the tick of a metronome. The independent variable was the appearance of the target handshape across four probe conditions and the age of the subjects as elementary school age (6-11 years) vs. older subjects(11-16 years). The dependent variables were (1) time recorded from the moment that the handshape was fully present on the screen until the buzzer was pressed and (2) error recorded as either false positives--pressing the buzzer when a handshape did not occur or false negatives--failing to press the buzzer when a particular handshape did appear. It is worth mentioning at this point that the students were very conservative in their responses. Thus, there was no record of false positive errors in this data.

Insert Figure 3 about here

Results and discussion. The results of this experiment are summarized in Tables 2 A and B. A two-way analysis of variance reveals a main effect of age both in time to respond ($F(1,72)=32, p<.01$) and in percentage of targets detected ($F(1,72)=21.5, p<.01$). Targets appearing

in the first position took longer to detect ($F(3,72)=16.5, p<.01$) but were not missed significantly more overall. This position effect probably reflects the fact that after the first letter of word is presented, subsequent letters or words are more constrained. That is, after you see the letter T, you are unlikely to expect an N to appear.

Insert Tables 2 A and B about here

What is perhaps more important than the difference in younger and older students however, is the finding that even the youngest group responded correctly 68% of the time or at a level well above chance in their recognition of handshapes within words and sentences. It also appears that the students, overall, are much better at detecting handshapes as letters than they are at detecting the same handshapes in signs. A t-test comparing average time of response to handshapes as letters or signs reveals a significantly faster response to handshapes when they are in less meaningful, low level forms of the language ($t(29)=2.97, p<.05$). These results are shown in Table 3 and are consistent with those presented in the hearing literature by McNeil and Stone (1965) among others.

Insert Table 3 about here

In sum, the results of the metalinguistic tasks thus far suggest (1) that students can and do segregate signed words from fingerspelled words, (2) that they recognize individual handshapes within fingerspelled words and (3) that they are better adapted at recognizing those handshapes in fingerspelled words than at extracting those same handshapes in signed words. This last point is important because one would want to selectively abstract individual handshapes from fingerspelled words for the purpose of realizing handshape to print correspondances. Handshapes used in signed words may not be as apparent and hence may not cause a reader as much interference in handshape-print relations as might initially be expected.

Experiment 3

The final metalinguistic task pursues the question of handshape transparency one step further by asking whether students can go beyond passive recognition of handshapes to manipulation and explanation of handshape use in the creation of a namesign. Within the deaf community, individuals are usually identified by a nickname or namesign. The first letter of a person's name becomes the handshape for a sign that is created to capture a dominant characteristic of the individual. If, for example, one wanted to assign a namesign for Pinnochio he would take a "P" handshape and use it to depict the dominant characteristic of Pinnochio--his long nose. A possible namesign for Pinnochio is illustrated in Figure 4. As is evident, the creation and explanation of a namesign involves a certain ability to manipulte one's language--especially in recognizing and abstracting the individual handshape that will serve as the basis for the sign form. Are deaf students linguistically talented enough to create a namesign for someone and to explain how they go about creating the namesign?

Insert Figure 4 about here

Method

All 25 students particiated in this task. Each was presented with a color photograph of a child. He was told the child's name in fingerspelling and was asked to assign a namesign and to teach the experimenter how one develops namesigns. As an extra incentive for the task each child was filmed on video tape and was allowed to see himself on TV.

Three different photographs served as stimuli. They portrayed children of 7 or 8 years of age each of whom had a unique characteristic. One child, for example, had long blond hair, another was oriental and a third had curly dark hair. Further all of these children were christened wih less common names (Patricia, Bernard, Cynthia) to deter the use of namesigns common to the student's friends.

Results and discussion

The results again point to the deaf student's awareness of individual handshapes within fingerspelled words. Even the younger children proficiently extracted the first letter from the uncommon fingerspelled name and made it into a sign that characterized the photograph. Further, all but 5 children, all in the 6-7 year old range demonstrated an ability to explain the process of name sign creation. This means that 8 of the 13 elementary school age children were adept in manipulating and explaining the use of fingerspelling in assigning namesigns.

General Discussion

In sum, deaf children appear to be able metalinguists when it comes to discriminating fingerspelled words and decomposing fingerspelling into the handshapes that map onto English orthography. The link between ASL and reading is both accessible and manipulatable by native users of the language. Further, it is accessible to those who are classified at the preprimer and primer levels of reading. Young deaf children bring this ability to analyze their language to the reading task.

In presenting these short experiments, it is not implied that there exists a <u>causal</u> link between reading competence and this fingerspelling use. There are, as yet, no experiments that suggest that better readers decode into fingerspelling or that training in fingerspelling decoding would accelerate natural reading. The former, tests for decoding, have failed to yield significant results in natural reading tasks. The latter, training, is currently under investigation.

It is suggested, however, that there is a potential link between the signer's natural language and reading, and that deaf students have the wherewithal to capitalize on this link. To the extent that these students have a word in their fingerspelled vocabulary, can access that word and are taught relations that exist between that word and the print, they have a natural inroad to the English alphabet. This link may permit them to decode words into fingerspelling in the same way that metalinguistic competence in spoken language permits decoding into sound. To the extent that a printed word is in the native vocabulary it helps users of the language to identify the word and subsequently to increase their written vocabularies.

There is some evidence in other research that the skills demonstrated in these metalinguistic experiments is more closely correlated with reading ability than with other measures of intellectual strength (Hirsh-Pasek, 1981). There is also limited evidence that training in finger-print rules does assist deaf individuals in being able to identify new printed words in word lists (Hirsh-Pasek, 1981). Consequently, if one can focus on the skills that deaf children have rather than on the void between the ASL and English one may promote overall reading proficiency. Certainly acquiring larger vocabularies will not solve all of the reading problems that deaf chidlren face (Quigley, 1982). Yet, the identification of words is the single best predictor of reading success (Shankweiler & Liberman, 1972; Davis, 1942, 1944,1972; see Johnson, Toms-Bronowski & Pittelman, 1982, for a review). Futher, as Hung, Tzeng and Warren (1981) recently noted, a greater facility with vocabulary would enable deaf children to free their attention from the learning of lower level word skills and to redirect that attention to the learning of syntax.

References

Battison, R. Lexical borrowing in American Sign Language. Silver Springs, MD: Linstok Press, 1978.

Blasdell, R. & Caccamise, F. Linguistic variables in visual and motor processing of fingerspelling. Paper presented at Annual Meeting of the American Association for the Advancement of Science. Denver, November, 1976.

Burroughs, E.R. Tarzan of the apes. New York: Grosset & Dunlap, 1914.

Davis, F. B. Two new measures of reading ability. Journal of Educational Psychology, 1942, 33, 365-372.

Foss, D. J. Decision processes during sentence comprehension: Effects of lexical item difficulty and position upon decision times. Journal of Verbal Learning and Verbal Behavior, 1969, 8, 457-462.

Foss, D.J. Some effects of ambiguity upon sentence comprehension. Journal of Verbal Learning and Verbal Behavior, 1970, 9, 699-706.

Foss, D.J. & Fay, D. Linguistic theory and performance models. In D. Cohen & J. R. Wirth (Eds.) Testing linguistic hypotheses. Washington, D.C.: Hemisphere Publ., 1975, 65-91.

Hirsh-Pasek, K. Phonics without sound: Reading acquisition in the congenitally deal. Unpublished doctoral dissertation, University of Pennsylvania, 1981.

Hung, D.L., Tzeng, O.J.L., & Warren, D.H. A chronomtric study of sentence processing in deal children. Cognitive Psychology, 1981, 13, 583-610.

Johnson, D., Toms-Bronowski, S., & Pittelman, S. Vocabulary development. Volta Review, 1982, 84, 5, 11-24.

Quigley, S. Reading achievement and special reading materials. Volta Review, 1982, 84, 5, 95-106.

Shankweiler, D. & Liberman, I.Y. Misreading: A search for causes. In J. F. Kavanaugh & I. G. Mattingly (Eds.) Language by ear and by eye. Cambridge, Mass.: The MIT Press, 1972, 293-317.

Table 1

WORD CLASSIFICATION EXPERIMENT

Mean % Correct Across Catagories

age	fingerspelling as fingerspelling	sign as sign	loan signs fingerspelling
6-11 yrs. (n=9)	100%	93%	97%
12-16 yrs. (n=12)	97%	97%	94%
Total	99%	95%	94%

Table 2

HANDSHAPE SEGMENTATION PROBE TASK

A: Time Date in 1/10 Sec.

age		position of probe 1	2	3	4 & 5
6-11 yrs. n=8	X=	.91	.61	.55	.49
	SD=	(.29)	(.13)	(.15)	(.14)
12-16 yrs. n=12	$\bar{X}$=	.63	.45	.49	.40
	SD=	(.13)	(.09)	(.13)	(.09)
Total	$\bar{X}$=	.74	.51	.51	.44
	SD=	.19	(.10)	(.14)	(.11)

B: % of Targets Detected

age		position of probe 1	2	3	4 & 5
6-11 yrs. (n=8)	$\bar{X}$=	54%	80%	68.7%	70%
	SD=	(18)	(10.7)	(22)	(10.7)
12-16 yrs. (n=12)	$\bar{X}$=	86%	75%	96%	92%
	SD=	(22.4)	(9.9)	(9.7)	(9.7)
Total	$\bar{X}$=	73%	77%	85%	83%
	SD=	(21)	(10.2)	(14.6)	(10.1)

Table 3

HANDSHAPE SEGMENTATION PROBE TASK

Time to Respond in 1/10 Sec

handshape in fingerspelling	handshape in sign
X = .61	X = .48
SD = .15	SD = .14

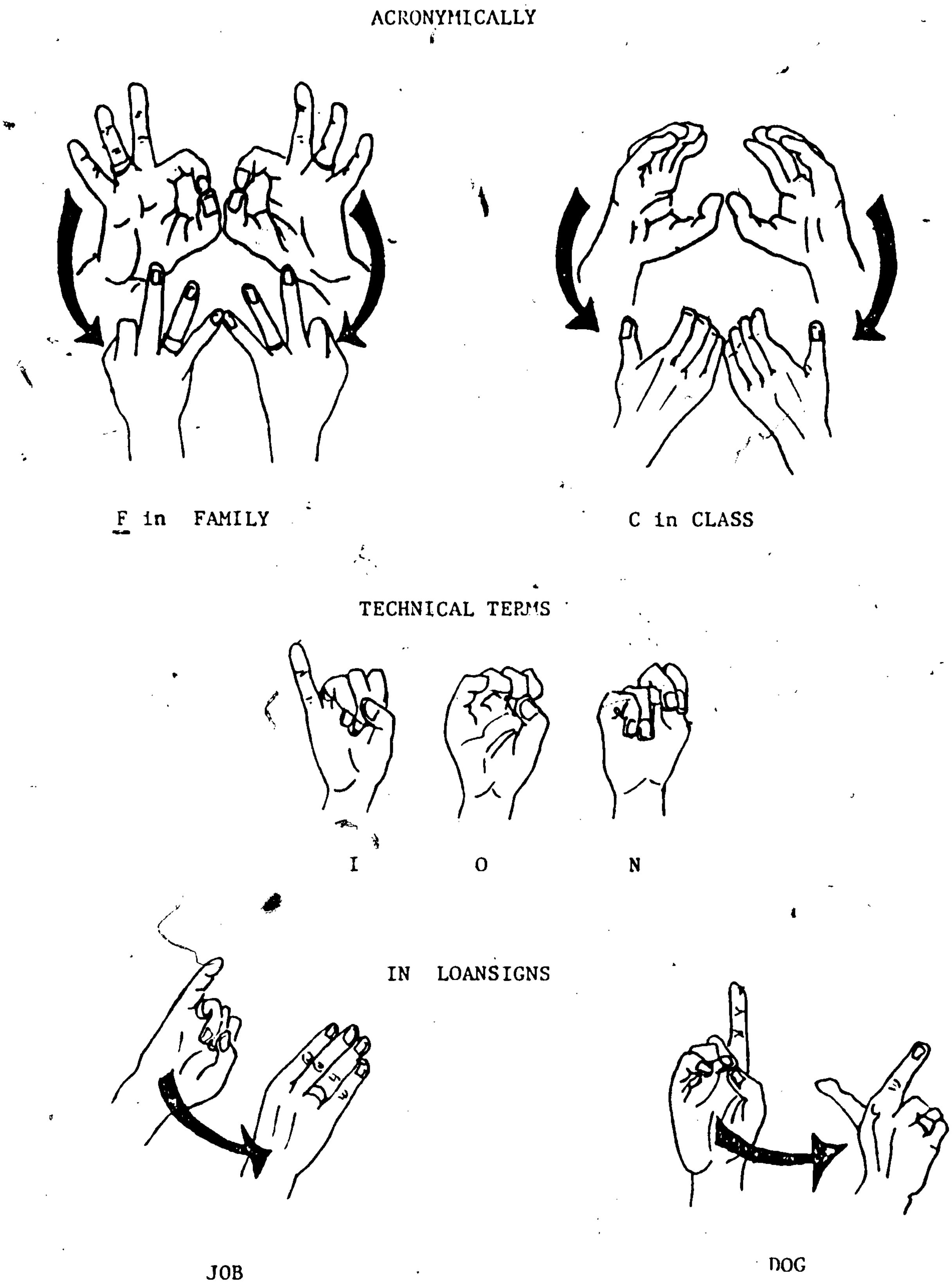


Figure 1: The uses of fingerspelling in ASL as (1) the dominant handshape in a signed word (acronymically), (2) as technical vocabulary borrowed from English and (3) as sign-like productions in loan signs.

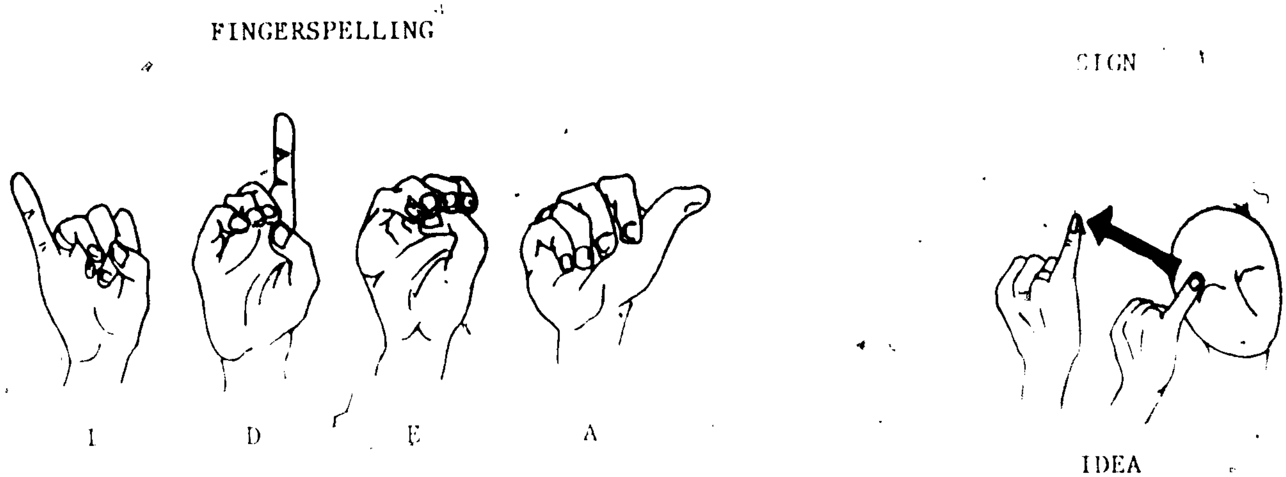
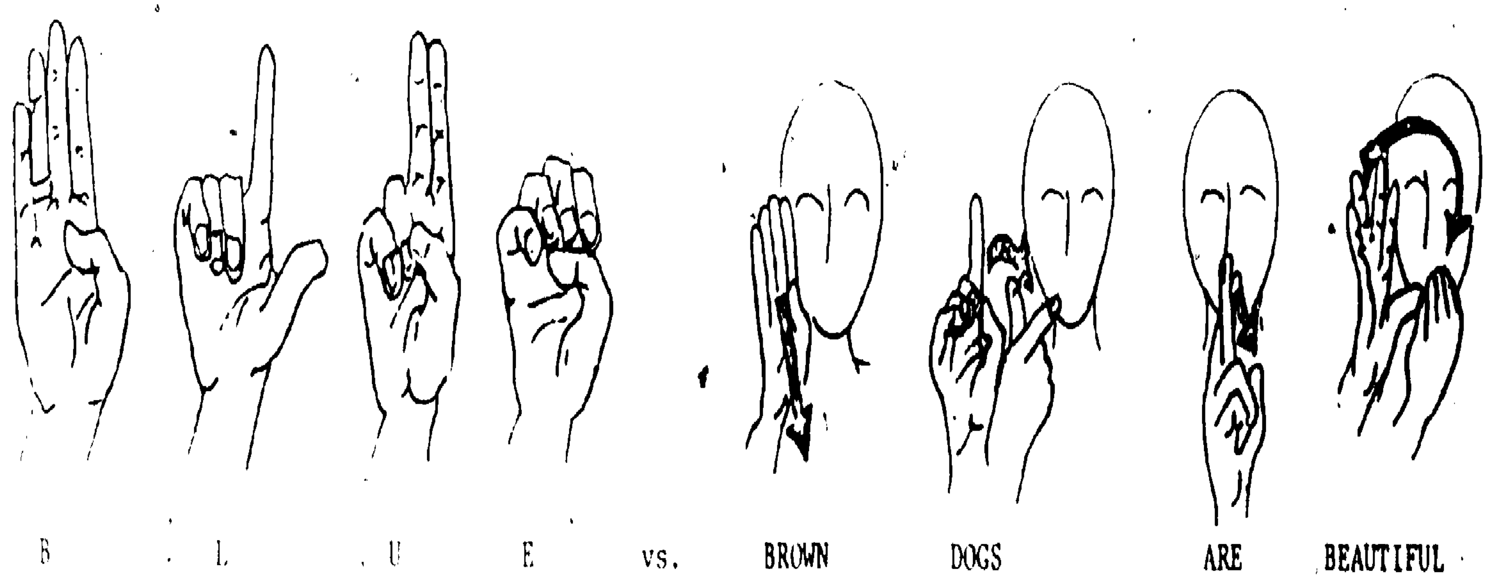


Figure 2: Differences in fingerspelled (letter-by-letter) and signed representations for the concept "idea."

Example 1: Probing the B-handshape



Example 2: Probing the V-handshape

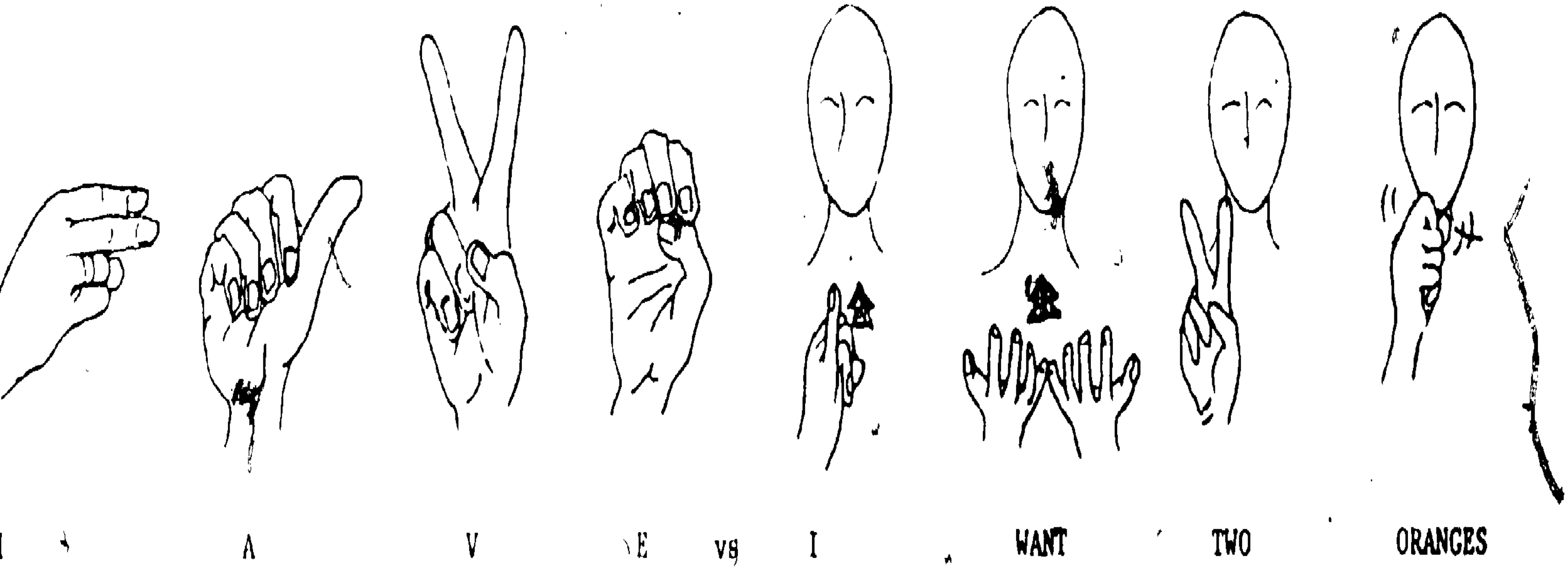


Figure 3: Examples of fingerspelled and signed stimuli from Experiment 2.

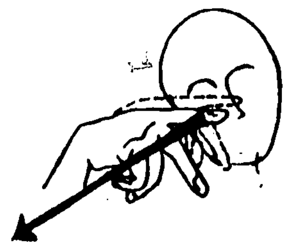


Figure 4: A possible namesign for the character Pinnochio using a P-handshape.