

Theoretical Issues in
Sign Language Research
Volume 2: Psychology

Edited by
Patricia Siple and Susan D. Fischer

The University of Chicago Press
Chicago and London

SC play, argue, wax poetic, and how often are they having enough trouble just getting the message across? These are interesting sociolinguistic questions. We may be ready now to deal more perceptively with the issue of mismatches of interlocutors; that is, we cannot always assume a language conflict or language contact situation (pidginization) when deaf and hearing people sign to each other. Nevertheless, there are differences in language knowledge and skill, and these should be investigated more systematically to provide an understanding of SC that may not be English based, as in our studies. We were, in fact, surprised at how little code switching and how few features of ASL we found. Studies of individual adaptation to different communicative situations might reveal a greater variety of language ability than previous models have suggested. Our data remind us that the sign language used in the United States is not a single homogeneous language code and that it is worthwhile to open our minds and direct our attention to the varieties of sign language and the combinations of speech and sign modes that we can see around us.

Finally, we wish to make a few remarks about the topic we have avoided, the education of deaf children. SC has been studied before primarily as an educational code. We are sensitive to the decisions that educators are trying to make in deciding on language and language modes to be used to help children acquire language—English in particular—at home with hearing parents or in schools of various kinds. Although educators do not have the luxury of waiting on research before they communicate with deaf children and their parents, we still think that the kind of work we are doing is necessary background to any decent evaluation of the pedagogical issues. There is no question that we need research on the input offered to deaf children and on what the children derive from that. Maybe a little child does receive only the sign channel, maybe the teachers are all incompetent; on the other hand, maybe the children receive something from the speech/mouthing channel at some point, and maybe some teachers are competent. What we are trying to do in our studies is to explore how fluent communication in SC works; we do not see how we can either advocate or condemn behavior in teaching children without this understanding. In other words, we have what may be a foolish dream, that we can separate the political issues of education from the linguistic ones. For all we know, this system may be terrible as language input for acquisition or terrible for interlocutors who do not use the speech channel receptively. That does not make it intrinsically terrible. Like other linguistic varieties throughout the world, it exists. Some people use it and some do not.

10 The Acquisition of Fingerspelling

by Deaf Children

CAROL A. PADDEN

10.1 Introduction

This chapter examines the emergence of fingerspelling in young deaf children whose first language is American Sign Language (ASL). Fingerspelling consists of positioning one hand to the side of the body and delivering a rapid sequence of hand configurations, each corresponding to a letter of the alphabet. The conventional wisdom is that young deaf children use fingerspelling to represent alphabetic characters. As I will demonstrate, however, the discovery that hand configurations correspond to alphabetic characters comes relatively late for deaf children.

Fingerspelling is particularly interesting because of its unusual properties as a language system. Fingerspelling is not an independent language system; instead, like writing, it is a representation of some other system, in this case English orthography. Yet it occupies a peculiar and constrained position in the larger system of ASL. Fingerspelled vocabulary does not appear freely but seems to be limited to a small set of grammatical categories. These and other types of constraints are among the knowledge young deaf children acquire as they become competent spellers.

That fingerspelling attempts appear long before young deaf children are able to read and write supports the general observation that fingerspelling has a prominent role in the language environment of deaf children in deaf families, but little has been reported on how they go about learning to use this unusual system—what types of productions they make and how learning it compares to learning a natural language. I present first a description of fingerspelling as a language system, then an account of the emergence of fingerspelling in young deaf children from age 2;1 to 4;9.

This chapter is a revised version of a presentation given at the Conference on Theoretical Issues in Sign Language Research, Rochester, New York, in 1986. Suggestions from Tane Akamatsu, Vicki Hanson, and an anonymous reviewer of an earlier draft have been gratefully incorporated in this version. I also thank Anne Dyson, Peg Griffin, Tom Humphries, David Perlmutter, Laura Pettito, Mark Seidenberg, and Ted Supalla for fruitful discussions on various aspects. Merric Davidson generously assisted with the data collection and analysis.

10.2 The System of Fingerspelling

In terms of its distribution in language communities, fingerspelling resembles written language. Comparatively few oral languages have accompanying written systems; likewise, comparatively few signing communities use a manual system for representing the oral language of the surrounding society. Furthermore, in communities where a manual system exists, the system tends to be used minimally, in far fewer categories than in the North American deaf community (in the United States and English-speaking parts of Canada). Deaf foreigners who meet American signers complain that they fingerspell "too much" and "too quickly."

Fingerspelling is only one system in a larger category of "manual systems" used in signing communities. It is not clear how such systems become adopted and widely used by a community of signers, since there are many signing communities that do not use a manual system at all. The American system of alphabetic hand configurations can be traced to an alphabetic system invented in the seventeenth century by a hearing priest, Juan Pablo Bonet, who developed it for the education of a young deaf boy. The system was subsequently adopted by a French educator, Abbé Sicard, who founded a number of public schools for deaf children in France. The system was later transported to Ireland and the United States. Great Britain's educational system for deaf children developed independently of the French system; its signed language is unrelated to ASL, and its alphabetic system is not one handed but two handed. Deaf people in Denmark use a "mouth-hand" system that coordinates lipreading and hand configurations. Deaf Thai signers have an extraordinarily complex manual system for Thai script, including its diacritics for tone. In Taiwan and Hong Kong, deaf signers trace ideographs in the air. (A collection of different manual systems can be found in Carmel 1975.)

The inventories of fingerspelled hand configurations and ASL hand configurations do not entirely coincide. Those fingerspelled hand configurations that also appear in ASL are A (also appears in PATIENT), B (also appears in HELLO), C (SEARCH), E (only in a regional sign, CUTE), F (INDIAN), G/Q (HOMOSEXUAL), H/U (NAME), I/J (THIN), L (FAST), O (ZERO-ON PAGE), R (BRAIDS), S (WORK), V (LOOK-AT), X (DOLL), Y (PLANE), Z (TRUE).¹ The remainder of hand configurations appear only in "initialized signs," a special subset of ASL signs considered "borrowed" from English: the hand configuration is the same as the fingerspelled first letter of its English translation. D appears

1. Signs are represented by glosses in small capitals—for example, TAKE. "to take." For a sign that requires more than one word to translate it, the glosses are joined by hyphens. Fingerspelled letters and words are represented by small capitals; in words, the letters are joined by hyphens; for example, C-A-R-O-L ("Carol"). Glosses for fingerspelled loan signs are preceded by the symbol #: #OK ("Okay"). The symbol + represents a morphological boundary.

in DEVELOP, K (KITCHEN), M (MISSIONARY), N (NOBLE), P (PRINCIPLE), T (TOILET), and W (WATER). In contrast, there are many hand configurations in ASL that have no counterpart in fingerspelling: the outstretched 5 hand (FATHER, MOTHER), the clawed 5 hand (MAD, YELL), the bent 2 hand (STRICT, SNAKE), the baby O shape (PICK-ON).

But what is often overlooked about fingerspelling is that there are other aspects to the task that are rarely made explicit: the construction of movement units that make up the fingerspelled item. For example, double letters may appear with a characteristic bouncing segment as in H-E-L-L-O, or with a movement internal to the handshape, as in T-R-E-E. The letters J and Z have tracing movements that are assimilated by segments preceding and following it. The G handshape has a number of different orientations depending on neighboring letters. In addition, there are conventional transitions between certain sequences and within common morphological segments—for example, I-O-N (the derivational morpheme *-ion*). These and other movement rules are among the conventions about fingerspelling that young children learn.

10.3 Subjects and Their Families

The data that form the basis for this chapter were taken from a larger home study with eleven deaf children ranging from age 2;1 to 8;5. This chapter focuses on the six younger children, ranging from age 2;1 to 4;9. The parents are also deaf except for one family where the parents are hearing but are native signers of ASL, having learned the language from their deaf parents. A primary language used in the home is ASL. Videotaped interviews and play sessions involving spelling, writing, and signing, ranging in length from about a half hour to an hour per visit, were carried out with each child. Table 10.1 below summarizes videotaped records for each child by age. In addition, field notes from an earlier study of child SS (Padden and LeMaster 1984) at age 2;9 were included, and in some cases the data collected in this study are supplemented by other colleagues' video records.

The parents of the children included in this study are white, middle class, and nearly all college educated. Except for those of one child, VV, one or both parents are employed at a local school for deaf children. In interviews they report that they consider learning to read and write an important goal, more important than learning to speak and lipread English.

All parents use ASL, but some use a more stylized language with their children, including "manual English" signs developed for pedagogical purposes. All parents in this study, however, agree that fingerspelling is an ideal way of representing English to their children and will use it to instruct their children

Table 10.1 Ages When Videotaped Records Were Made of Six Deaf Children

CC	TT	MM	KK	BB	VV
2;1	2;9	3;11	4;3	4;6	4;7
2;3		4;1		4;8	4;8
		4;2			4;9

in "what the English words are" even if they are using pedagogical signs in the home. Note that fingerspelling is probably more prominent in these particular families because of the parents' professional and personal interest in teaching their children about English. In other deaf families it may be used less. Maxwell (1983b, 1984) describes some deaf families where fingerspelling is used to a much lesser extent than in the families in this study. In such families the children may not learn fingerspelling until they arrive at school.

The parents said they actively tried to encourage print-fingerspelling associations when they felt children were ready, sometimes as young as 2 years of age. All had a large assortment of educational toys for introducing print to their children. One child had a playroom where the parents attempted to replicate the environment of the school, along with school-issue chairs and desks, play blackboards, books, paper, and pencils. The children in this family were encouraged to sit at their desks while writing and drawing. Children as young as 2 years were encouraged to play with plastic letters, and at about 3 years the parents urged them to begin making sequences of letters for spelling their names and those of their siblings. With children they felt were "ready," the parents played games matching plastic letters with fingerspelled characters, usually for spelling out the child's name.

Despite the parents' early efforts to associate fingerspelling with print, very young children seem unaware of the connection between a hand configuration and an alphabetic character until about 3 years of age. Even then, their associations between fingerspelling and print remain tenuous and uncertain.

10.4 Fingerspelling among Deaf Adults

Before exploring how deaf children acquire fingerspelling, it seems sensible to ask how the system is used by adult signers. Unfortunately, fingerspelling has received little of the attention directed to signed languages. It has been well documented that ASL, the primary language of the American deaf community, is not dependent on or derived from English (for a recent summary, see Padden 1988). Fingerspelling, in contrast, is typically identified as an example of a manual activity that is not signed language. It is described as a code, a system used for representing the alphabetic characters of English orthography.

In one of the few published analyses of adult uses of fingerspelling, Bat-

tson (1978) observed that many fingerspelled items enter the sign lexicon in the form of "loan signs." In such cases of "unstable fingerspelling," the resulting loan form loses much of its original structure and absorbs structural properties of signs. Newly borrowed items typically have a reduced number of hand configurations, from the full number of configurations for each letter in the word in fingerspelled words to only two in their loan sign counterparts. In these reduced forms, loan signs are phonologically consistent with the class of signs in ASL that may have at most two hand configurations per segment (Permuter 1990). Many loan signs are verbs—for example, #NO ("to say no to"), #BACK ("to go back to")—incorporating inflectional movement.

But basic questions about the category of fingerspelled items, not loan signs, and how signers use fingerspelling have not been investigated. As a preliminary way to answer questions about adult use of fingerspelling, four segments of an adult's conversation with another adult were transcribed. Segments roughly identical in length were taken, one from each of four topics: how to bake a meat dish, a personal experience with the police, a description of a television movie, and a description of how to buy a house. A total of 2,123 manual lexical items (an item is equivalent to a "word") across all segments were recorded, excluding morphology marked by facial or body position. A sign with complex morphology such as a classifier sign was counted as one item. Out of 2,123 manual items, 105 were fingerspelled and 32 were loan signs. The proportion of fingerspelled items among manual items, words and loan signs combined, across the three segments was approximately 6 percent. Some topics had a higher proportion of fingerspelled items: how to bake a meat dish had 12 percent (27 fingerspelled items out of 231 items) compared with 4 percent (17 out of 432) for a personal experience with the police. (Table 10.2 summarizes these figures.)

From an inventory of all the fingerspelled items (table 10.3), at least one striking difference emerged between fingerspelled words and signs: there were almost no fingerspelled verbs. When verbs are followed by prepositions, fingerspelling is restricted to the prepositions, for example, TAKE O-V-E-R. From

Table 10.2 Number of Fingerspelled Words and Loan Signs in Four Excerpts from an Adult's Signed Conversation with Another Adult

Activity	Number of		Percentage of Fingerspelled Items
	Total Items in Segment	Fingerspelled Items	
Watching television	824	20	5
Buying a house	636	48	8
Baking a meat dish	231	24	12
Experience with the police	432	13	4

Table 10.3 The Different Fingerspelled Items Produced by an Adult in a Conversation with Another Adult across Four Videotaped Segments

<i>English terminology</i>	<i>Proper names</i>	<i>Phrases</i>
C-H-A-N-N-E-L	T-O-Y-O-T-A	ON S-A-L-E
T-V-D-I-N-N-E-R	I-O-H-N	TAKE O-V-E-R
G-A-S-O-L-I-N-E	J-A-N	MOVE O-U-T
J-U-R-Y	A-L-B-A-N-Y	CLEAN O-U-T
C-A-S-E	L-A-N-E-Y	FORGET I-T
D-U-P-L-E-X	S-L ("San Leandro")	STOP S-I-G-N
D-O-W-N ("payment")		COOKIE S-H-E-E-T
U-N-C-L-A-I-M-E-D		GREEN P-E-P-P-E-R
T-A-X	<i>To identify members of a descriptive class</i>	L-E-A-N MEAT
N-O-T-E-S ("trust deeds")	H-O-L-E	O-R-E-L-S-E
F-E-E	T-R-A-Y	
E-S-C-R-O-W	S-L-I-C-E	<i>Replicating print</i>
D-U-O	C-A-R-R-O-T	F-O-R S-A-L-E
C-O-M-M-I-S-S-I-O-N	B-A-C-K-S-E-A-T	T-H-E O-W-N-E-R
O-W-N-E-R	G-A-R-A-G-E	("For Sale by Owner")
D-E-A-L	S-H-E-E-T	T-H-E BURN B-E-D
M-P-H ("miles per hour")	G-R-O-U-N-D B-E-E-F	("The Burning Bed")
L-B-S ("pounds")	D-O-O-R	
F-O-I-L		<i>Function words/pronouns</i>
C-E-L-E-R-Y	<i>Verbs and adjectives</i>	I-F
P-A-R-S-I-E-Y	S-E-X-Y	O-R
P-L-A-S-T-I-C	S-I-C-K	T-H-E-N
R-F-E-N-T ("rental unit")	Q-U-I-L-T-Y ("guilty")	U-N-L-E-S-S
R-E ("traitor")		H-E
A-D-U-L-T		
O-I-L		
R-E-P-A-I-R		
F-L-A-Y-T		
O-W-N-E-D B-Y		
O-R-E-L-S-E		

observations of fingerspelling in nonvideotaped conversations among adults, some verbs do appear, but they are relatively rare. Over 50 percent of all fingerspelled items were English nouns or proper names. Fingerspelled loan signs, in contrast to fingerspelled words, can be verbs. Fingerspelling and signing appear to differ not only in structural organization but also in the grammatical categories represented. When fingerspelled items are borrowed into the sign lexicon, the resulting forms are no longer constrained in grammatical category.

Of those fingerspelled words that appeared in the sample, nearly all can be placed into one of a small set of categories. The first category is made up of items that represent or translate English terminology or abbreviations of English terminology (including proper names). Within this category are finger-

spelled phrases to represent common English phrases. A second category, equally common, is made up of items that identify a specific member of a descriptive class. These include sequences of classifiers followed by a fingerspelled word identifying the specific member of the classifier inventory. The third category involves use of fingerspelling to represent print, as in titles and on signs. A final category is made up of items that are themselves grammatical markers.

Some items listed under "English terminology" have roughly equivalent sign translations—for example, "fee," can be translated as CHARGE, "pounds" (WEIGH), "duplex" (TWO-ENTITIES-NEXT-TO-EACH-OTHER), "repair" (FIX), "adult" (ADULT). Fingerspelling seems to function in these contexts as a means of directly translating key English terminology, needed in situations when signers discuss events involving these terms.

Other fingerspelled items are not translations but independent lexical items. The sign RENT/MONTHLY (verb) means "to pay a monthly fee." There is also a loan sign, #RENT, which means "to rent," as in "to rent a car." The fingerspelled words R-E-N-T, as used by the adult in these segments, has yet another meaning: "a rental unit." Baitson (1978) notes that loan signs typically have meanings that do not coincide with the range of meanings for the original English word, but the same seems to be true of some fingerspelled items. The fingerspelled function words appear also to have meanings unlike their closest sign translations. ASL has a number of complementizers, including IF, WHICH/WHETHER, FINISH, BUT, and others, but these have slightly different meanings than the fingerspelled items. These examples suggest that fingerspelling is used not only for representing English terms but, like loan signs, for creating lexical items that need to be distinguished from existing sign vocabulary.

A prominent class of fingerspelled items includes those that identify a specific member of a descriptive class. For example, the descriptive classifier HORIZONTAL-FLAT-OBJECT is used for a wide range of objects, including the shape of a bed, countertops, and floors. In one segment the signer uses HORIZONTAL-FLAT-OBJECT, then follows it with the fingerspelled word "sheet." The signer has identified a specific item, a baking sheet, from among several possible flat objects. In another example, the fingerspelled word "garage" follows the sign TWO-VEHICLES-LOCATED-SIDE-BY-SIDE. The classifier does not mean "garage," but rather refers to two vehicles parked together in a particular location. The signer uses the fingerspelled word to disambiguate between several alternative meanings—for example, "two cars next to each other in a parking lot," or "two cars next to each other in a garage." Similarly, the fingerspelled C-A-R-R-O-T is used following the signer's use of a regional sign CARROT, not likely to be known by many other signers. The latter uses of fingerspelling do not coincide with the commonly held

view that fingerspelling is used solely for representing English words; instead, at least in limited cases such as these, fingerspelled words have meanings independent of English words and ASL signs. But what is surprising about fingerspelling is the almost total absence of verbs in the transcribed sets. In the case of fingerspelled words that follow classifiers, the examples suggest signs and fingerspelled items appear in certain constrained structures. The system of fingerspelling is not entirely marginal or supplementary but occupies a peculiar niche for deaf signers and, it would be reasonable to expect, for deaf children as well.

10.5 Parents' Fingerspelling with Children

From our videotaped records of parents interacting with their children, the parents seem to fingerspell less with young children. MIM's mother, in one exchange of stories with her daughter, used 5 fingerspelled items, 4 fingerspelled signs (#OR, #OK, #OK, and #WNT), which appeared in a total of 284 manual items (3.9 percent). TT and KK's father used 11 items in his exchange, 10 fingerspelled words plus an 11th item, a fingerspelled sign, #ALL. Of the 207 manual items that appeared in his story, 5 percent were fingerspelled items. An inventory of the different fingerspelled words appears below in table 10.4.

Since the adult data show a higher percentage of fingerspelled items in a signed exchange, those data suggest that parents modify the amount of fingerspelling they use with their children—at least their younger ones. However, the range of items used by parents falls into the same categories found in adult fingerspelling.

As replacements for items they would normally fingerspell, parents said they substituted signs. One parent described how the family had gone along with his child's invented signs for the different cereals he ate: MONSTER CEREAL, "Count Chocula," TIGER CEREAL, "Frosted Flakes," although he and his wife fingerspelled the names of the cereals to each other. Another parent invented special signs for the different types of juices, for example, Hawaiian

Table 10.4 Different Fingerspelled Items Produced by Parents during Conversations with Their Children

English Terminology	Proper Names	Function Words/Pronouns
Y-A-R-D	B-A-R-B-I-E	A
Y-A-R-D-S	K-E-N	O-F
D-O-G	B—[name of child's playmate]	O-R
B-L-O-C-K-S		S-O

Punch. However, the parents say they try to fingerspell more to their children as their perceptions about their "readiness" change.

10.6 The Emergence of Fingerspelling

The earliest fingerspelled attempt by a young child is very often the child's own name. Middle-class deaf parents believe that being able to fingerspell one's own name and others' names at an early age is a good sign of precociousness and language skill. In one videotape, a deaf mother is shown prompting her deaf child at age 2;7 in how to fingerspell his name. MIM at 3;11 can successfully fingerspell her own name. But CC at 2;3 can only use his "name sign." Deaf parents usually, but not always, give name signs to their children. Sometimes in the case of very short names, the parents may opt to only fingerspell the name. Name signs commonly use the alphabetic handshape of the first letter of the child's first name with one of a small set of possible movement and location structures (Supalla 1990). CC at 2;3 can correctly use the name signs for himself and his brother. He can also correctly identify himself and his brother when shown their name signs. As a test to see how well the child could recognize his own name sign, the experimenter invented a name sign with movement and location similar to the child's own but with a different hand configuration. CC was confused and then pointed to a place outside the room, showing that he could recognize hand configurations in name signs and make correct judgments. At ages younger than 4, however, children can usually fingerspell only their own names and occasionally that of a sibling.

From an early age, deaf children start to theorize about the differences between signing and fingerspelling. In field notes with SS at age 2;9, we see an example of a deaf child's early functional differentiation between signing and fingerspelling/spelling. When SS was asked what something was, she provided a sign, but when asked the name of an item, she reverted to fingerspelling. MM at age 4;2 explained to her mother in one videotape that the ELEPHANT+'S NAME was too long and she liked the CAT+'S name better because it was easier to fingerspell. The girls' functional differentiation between fingerspelling and signing resembles early differentiation between drawn and written representations in hearing children (Ferreiro 1984). Ferreiro describes how young children identify the picture of an object as "what something is" but its written word as "its name." As an indication of the "nameness" of a written word, Ferreiro observes that the children in her studies label their picture of a doll as "a doll" but label its written representation as simply "doll." The omission of the article signals the child's awareness of the object's "name."

MM at age 4;2, and likewise SS at 2;9, understands that fingerspelling and signing differ in distribution. While playing with the video camera, MM's older sister tells MM to "say something into the camera." MM begins to introduce herself, then mimics fingerspelling to give names of people around her. Her "fingerspelling" involves no clear sequence of hand configurations; instead, she blurs the handshapes and bounces her hand up and down in the characteristic fingerspelling style. She has not yet learned how to spell names, but she knows in what form and context they are to be produced.

The conventional wisdom about fingerspelling is that learning to fingerspell, and consequently learning to spell, involves learning to create the right sequence of hand configurations. From her studies of hearing children of deaf parents from age 3;8 to 5;3 learning to fingerspell, Akamatsu (1982) describes how her children learn to mimic the "movement shape" of the target fingerspelled word. In such attempts, individual hand configurations are often substituted or deleted altogether. She argues that, contrary to popular expectation, children are not merely learning to create a sequence of hand configurations but are learning the characteristic grosser movements involved in constructing the fingerspelled word. These movements include distinctive transitions between hand configurations and the movements within the handshapes themselves as they learn to "fingerspell." Her work makes clear that the distinctive units of fingerspelling are not solely the hand configurations themselves, but also movement units that combine to construct the movement sequence of the whole word.

Padden and LeMaster (1985) report videotaped records of similar examples in deaf children of deaf families as young as age 2;7. As DD tries to spell the name of a relative, D____, he makes the first hand configuration corresponding to the alphabetic letter L, then changes to the hand configuration for the remaining two letters, which are doubled. For the doubled letters, he bounces his hand to the side in an exaggerated form of the normal doubled handshape sequence. The mother corrects the child and fingerspells the three hand configurations distinctively, including the correct initial handshape D. Following Akamatsu's analysis of early fingerspelling attempts, DD correctly analyzes the feature [+extension] in the target production of the hand configuration D and substitutes another hand configuration marked [+extension]: L. Then the child moves into position for the hand configuration corresponding to the next letter and exaggerates the characteristic bounce for doubled handshapes, indicating again that the salient features of fingerspelling to the young child are not exclusively features of hand configuration.²

SS's mother reported that SS at age 2;6 had made several fingerspelling attempts, including an attempt at t-c-e that involved a repeated movement clos-

2. I thank Ursula Bellugi for making this videotaped segment available to me.

ing the hand between the open "clawed" hand configuration and the configuration for the letter E. SS replaced the closed, fingers-bent hand of the hand configuration C with an open, clawed shape and followed it by the enclosed shape of the letter E. She then produced repetitions of the sequence. Another example of SS's early productions was her approximation of o-k, "Okay." In the adult form, the transition from o to k is produced with a wrist flick downward. SS's production involved the same wrist flick downward, but with only one handshape, K.

This activity of generating a movement unit, or a sequence of movement units, I shall call "fingerspelling," and I shall distinguish it from another activity called "spelling." By about 4 years old, deaf children know how to position the hand correctly for fingerspelling, but they are faced with a more difficult problem. On what basis do they select the sequence of hand configurations that make up a fingerspelled word?

10.7 Differences between Fingerspelling and Spelling

At the same time SS was mimicking the shape of fingerspelling, she was also doing a different activity. At age 2;9 SS was asked what the name of her dog was; she produced a sequence of three clearly articulated segments: u-b-a. (The dog's name was Sasha.) She was then asked to name other objects in the room. For the table, she produced: e-b-a. When asked what her name was, she replied with the name sign assigned to her by her family. When asked to FINGERSPELL, she hesitated and looked at her mother. She then produced e-u-b. (None of these letters appear in her name.) Her mother reported later that SS had just started to learn how to spell her name but had not yet succeeded. Later, at her mother's prompt for the first letter, SS tried her name again, choosing three letters that were correctly drawn from the letters in her name. Although this sequence of configurations was not correct, they were in the correct order. But not all such attempts, as shown in the earlier examples of u-b-a, e-u-b, e-b-a, coincide with the target fingerspelled item. The activity of consciously constructing a sequence of hand configurations I shall call "spelling."

At age 2;9 SS had a perplexing task ahead of her: to select the "correct" sequence of hand configurations when spelling, to learn to spell her dog's name as s-a-s-h-a, rather than u-b-a. Akamatsu (1982) reports that by the time the hearing children in her study had reached school age, they had begun forming correspondences between sound and hand configurations. Early attempts at these sound-configuration correspondences closely resemble Read's examples of creative print spellings in young children (1971, 1975), for example, l-l-e-n ("lion"), t-r-d-l ("turtle"), and m-u-c-e ("mouse"). But for

deaf children, forming an association between fingerspelling and English words requires strategies different from the ones hearing children use, for at least one obvious reason—they do not yet know the sound structure of English.

When she was asked to "name" objects around her, SS at age 2;9 was unperturbed. She was willing to provide an attempt when asked. "Spelling" to SS merely involved executing a sequence of hand configurations. At older ages—MM at 3;11 and 4;1, BB at 4;8, and VV at age 4;7—children begin to suspect there is more to the task of "spelling" than creating any sequence of hand configurations. VV at 4;7 was willing to comply with requests, but she was easily distracted. She spelled C-N-I-T in response to a request to name a computer keyboard. A picture of an airplane elicited Y-O-B and a coat, R-I-B. These selections are not entirely random; in the next section, some strategies for selection are outlined. By age 4;11, VV was clearly uncomfortable with such requests and squirmed whenever she was persuaded to try. She finally understands that there is a fixed sequence for every English word, and she does not yet know them. Along with this awareness comes discomfort and embarrassment at not being able to produce the sequences.

At these ages, however, children's ability to recognize spelled sequences outstrips their ability to spell the words themselves. KK at age 4;3 could recognize fingerspelled color words. When asked to select correct colored pens upon being shown their fingerspelled names, KK confused only "black" and "blue," most likely because the initial two letters are identical. MM at 4;2 could correctly distinguish all fingerspelled colors including black and blue. MM could also recognize a small fingerspelled vocabulary including cat, dog, pig, boy, girl, boat, elephant.

At age 2;6, TT could use several fingerspelled loan signs, but the forms were reduced: #TV ("television"), but instead of the initial T handshape, she substituted the formationally similar S shape. TT also used #OFF ("take off"), but did not articulate the initial O handshape and instead selected F, using the characteristic sweeping movement of the loan sign.

What do early spelling attempts by deaf children look like? TT could fingerspell, laboriously and carefully, only her name and that of her brother, KK. She offered only one handshape, R, when asked by a parent to fingerspell "radio." She was later prompted by the parent into spelling the remainder of the word, but she could not produce the same word a few minutes later. It is not until the children are into the middle or late part of their third year that they show attempts at sequences of hand configurations.

As stated earlier, the spelling attempts of deaf children in this study do not resemble those of Akamatsu's children, indicating that some other strategy for selecting hand configurations is in place. From the spelling attempts collected, at least three basic strategies can be detected. As will be seen from the

examples below, some strategies are system internal, based on generalizations about fingerspelling itself; others are system external, based on theories about the correspondence of fingerspelling to other language systems in their environment.

10.8 System-Internal Strategies for Spelling

One strategy involves executing the first handshape of the fingerspelled word in its correct initial position. Examples of the different attempts from KK, MM, VV, and BB using this strategy appear in table 10.5.

For some attempts, other letters in the word are correctly selected, including the final position letter—for example, D-A-G ("dog") and A-R-L-L-E ("apple")—but in other cases the remainder of the word bears no resemblance to the original: B-A-T for "bird," and O-W-Y for "orange."

A second strategy involves replicating other salient features of the fingerspelled word. A common feature is the characteristic movement that accompanies double letters. For both "green" and "tree," many children correctly replicated the E-E sequence. In some cases the children repeated the characteristic movement but incorrectly selected the letters to be doubled. For example, instead of L-L in "ball" and "doll," two children doubled the preceding letter. Certain other sequences seem to be especially salient, for example the O-W- sequence in words like "yellow" and "brown."

Finally, there are spelling attempts that seem to be theories about comparisons across words, those that recognize that words can have similar sequences. The O-W sequence appears in both Y-E-L-L-O-W and B-R-O-W-N. One child spelled G-E-E-N for both G-R-E-E-N and T-R-E-E. The sequence B-L-U-K-E for B-L-U-E indicates a comparison between B-L-U-E and B-L-A-C-K.

Table 10.5 Deaf Children's Spelling Attempts Using First Letter of Word

Target	Spelling Attempts
Black	B-A-K-L-K, B-L-A-K
Blue	B-A-K, B-U, B-L-U-K-E
Pink	P-I-K
Red	R-I-E, R-A-P, R-L-E
Orange	O-W-Y, O-S
Yellow	Y-P-E-W, Y-O-W-N
Green	G-E-E-N, G-S-E-E
Purple	P-U-P-L-E
Cat	C-T-F, C-D-T
Ball	B-O-O-L
Dog	D-A-G
Apple	A-R-L-L-E
Bird	B-A-T

These system-internal strategies point to attempts by deaf children to generalize about sequences of letters based on the small inventory of fingerspelled words they recognize and can themselves spell.

10.9 System-External Strategies for Spelling

The two strategies described above draw from within the system of fingerspelling and children's new, but limited, knowledge of English orthography. There is another strategy that, unlike the other two, draws from outside the system of fingerspelling—from the natural language ASL. In this strategy children use the hand configuration of the sign as the first letter of the fingerspelled word. For most signs in ASL, there is no direct correspondence between the hand configuration of the sign and its nearest English translation. But for a small set of ASL signs, including vocabulary young children are likely to use—color words—the hand configuration corresponds to the first hand configuration of its fingerspelled translation. For example, the sign BLUE has a hand configuration that is also the fingerspelled handshape for the letter B. This set of signs are called "initialized signs."

A large subset of initialized signs used in the deaf community are name signs. Name signs use the first letter of the person's first, middle, or last name. At age 2;6, TT identified herself using her name sign. She identified her brother by his name sign, which coincides with the first letter of his name. TT began spelling her brother's name, correctly choosing the first hand configuration, but she was unable to finish it. VV at age 4;7, when asked to fingerspell the name for a list of signs, demonstrated that she exploited initialized signs as a good source of information about at least the first letter of its fingerspelled translation. When asked to name an individual whose name sign used the letter C, VV mimicked a fingerspelled word with only the first letter, C, clearly identifiable.

The problem facing these young children is that they do not yet know which signs are initialized and which are not. The same B handshape that is used for BLUE is also used in a great many other signs in which the first letter of their English translations is not B—for example, WINDOW, DOOR, SOCCER, and WOOD. When shown a picture of a racket, VV gave the correct sign, then proceeded to produce the first letter of the word using the same hand configuration for the sign, S. The hand configuration for AIRPLANE is Y; VV produced a Y-O-B sequence in response to a picture of an airplane. Neither RACKET nor AIRPLANE is an initialized sign. KK was shown a picture of a chicken and given the correct sign, which involves a G hand configuration. Then he spelled its name as G-I. For TREE, with an outstretched 5 hand configuration, KK offered the 5 handshape as the first letter of its fingerspelled word, but he was unable to finish the word. Younger children are willing to try spelling not

only those hand configurations that coincide with the small inventory of alphabetic hand configurations, but even shapes outside this inventory. Older children, about age 5, understand that the outstretched 5 handshape is not in the inventory of possible fingerspelled characters and will simply say that they do not know how to spell the word (Padden, n.d.).

Children as young as 3 to 4 years already display rudimentary awareness of English orthography. They are beginning to understand which letters are likely to appear word-initially. Beginning at about age 5 and 6, deaf children's spelling attempts begin to resemble the target words more closely in length and sequence. By age 8 or 9, deaf children begin to make errors more similar to errors made by deaf adults, including many that involve omissions or additions of syllables and reordering of letters—for example, *replite* for "reptile" and *mirgate* for "migrate" (Hanson 1982b; Hanson, Shankweiler, and Fischer 1983; Padden, n.d.).

As a summary of the spelling data collected from six deaf children at age 2;1 to 4;9, the following progression can be outlined.

1. A *minimal sequence of hand configurations*. TT at age 2;9 produces only a single hand configuration whenever asked to spell, except for her name and that of her brother. SS at 2;9 begins to produce sequences, but usually no longer than three letters: U-B-A, E-U-B, E-B-A. What seems to matter most is the production of a minimal sequence of hand configurations rather than attending to which hand configurations should be chosen.
2. *Selection of hand configurations*. The older children begin to attend to choices of configurations, but not their sequence. VV, at age 4;9, spells "cat" with the initial C, but the sequence is realized variously as: C-R-I and C-N-I. From field notes with AA, SS's older sister, at age 4;11, AA was playing with her father and was purposely distracted while the father removed a piece of candy she had left on the table. When AA returned to playing with her father, she quickly noticed that her candy was gone and demanded to know where it was. The father, in mock seriousness, explained that E-T ("the Extraterrestrial") had taken the candy away. AA laughed and said it could not have been him, spelling the name as T-E. MM at age 4;2 accepted either P-I-G or G-P-I for a picture of a pig.

From analysis of older children, starting from about the end of their fourth year, it seems their spelling attempts reflects awareness of both selection and sequence. During an outing with her family, VV at age 6;6 could spell many words correctly but had difficulty remembering how to spell "Coke." When her father asked her at a restaurant what she wanted to drink, VV began to

spell: C-A-O, then stopped herself and tried again C-O-K. . . . The father prompted E, and VV nodded her head impatiently: C-O-K-E.

10.10 Interaction of Fingerspelling and Writing

From their work with hearing children learning to write, Ferreiro (1984) and Dyson (1986) find that early written attempts are not isolated but often interact with children's understanding of other systems in their symbolic world, notably drawing. In some early writing attempts by hearing children, a written character can be represented as both a figure and a letter, as in the case of one young child who used the same line element to represent both "a nose" and "a letter." Later they make the transition to identifying the naming properties of writing.

Not surprisingly, early fingerspelling attempts show interaction with writing as deaf children explore the ways fingerspelling can be connected with making print. Almost always, when the 4-year-olds were asked to write, they fingerspelled to themselves, producing a hand configuration for the letter before beginning to write it. VV, at age 4;8, had interesting ideas about how fingerspelling and print are related. Like hearing children who attend to properties of speech, VV attended to the physical properties of fingerspelling as she attempted to write characters for the individual hand configurations.

VV was asked to write the names for stickers representing objects on a piece of paper. She insisted she did not know which letters to put on the page and wanted them spelled out for her. The experimenter then proceeded to fingerspell the word, at which point VV interrupted and asked the experimenter to deliver only one hand configuration at a time. For example, she would look at the first hand configuration, P, write a character, look up again and wait for the next configuration, write the character, and so on until informed by the experimenter that "there are no more." VV made no comments about length of the fingerspelled word or its appropriateness to the sticker; instead she devoted her efforts to writing the character. Figure 10.1 shows that several of her characters were ideographic attempts to represent the features of the hand configuration.³ The character A, which she used to represent the first letter in "purse," mimics the two outstanding features of the handshape P: the higher extension of the index finger, and the lower extension of the middle finger (see fig. 10.2).

The following month, at age 4;9, VV performed the same task with a different set of stickers (fig. 10.3). Some of the same ideographic representations she used the previous month appear in this sample as well. She used her inverted representation for P for a formationally related hand configuration, K. The handshape K is minimally distinct from P; in P the hand is oriented upward, but in K, it is oriented downward. VV also used a small set of written

3. The background is dark because the writing was done on dark red construction paper.

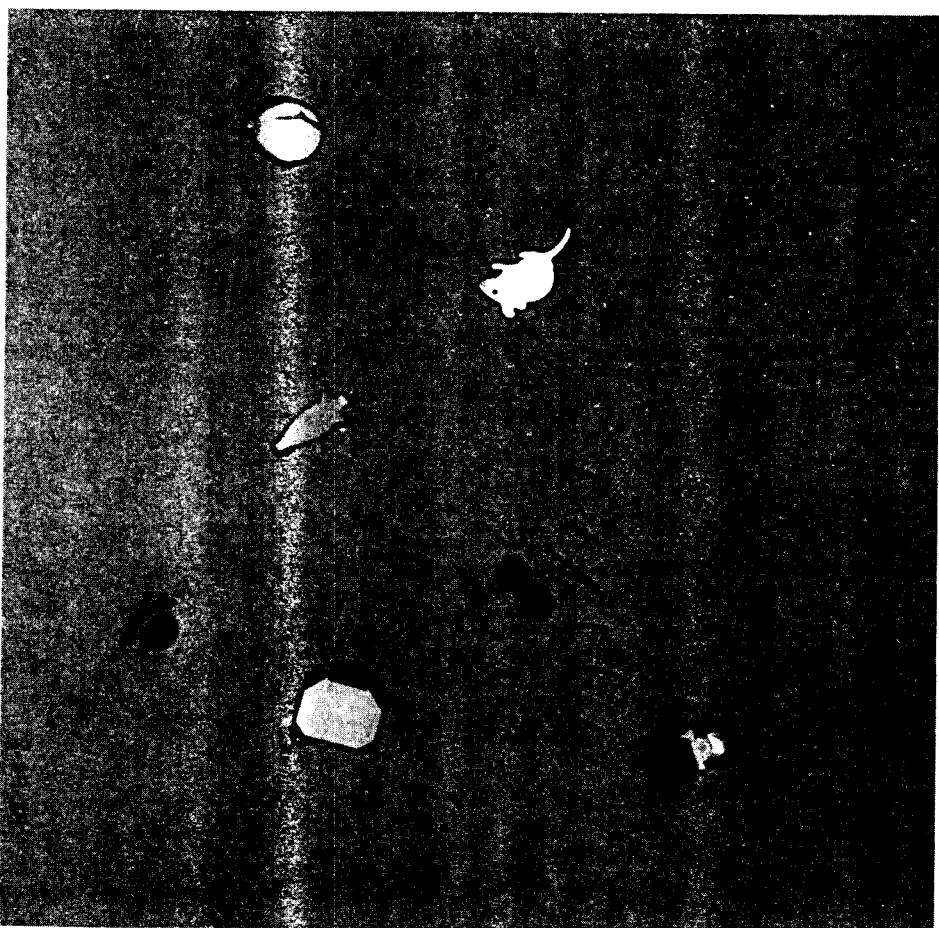


Figure 10.1. VV's attempts to write at age 4;8.

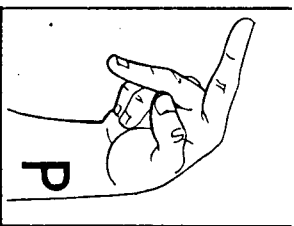


Figure 10.2. Fingerspelled hand configuration for P. From Tom Humphries and Carol Padden, *A Basic Course in American Sign Language* (Silver Spring, Md.: T. J. Publishers, 1980).

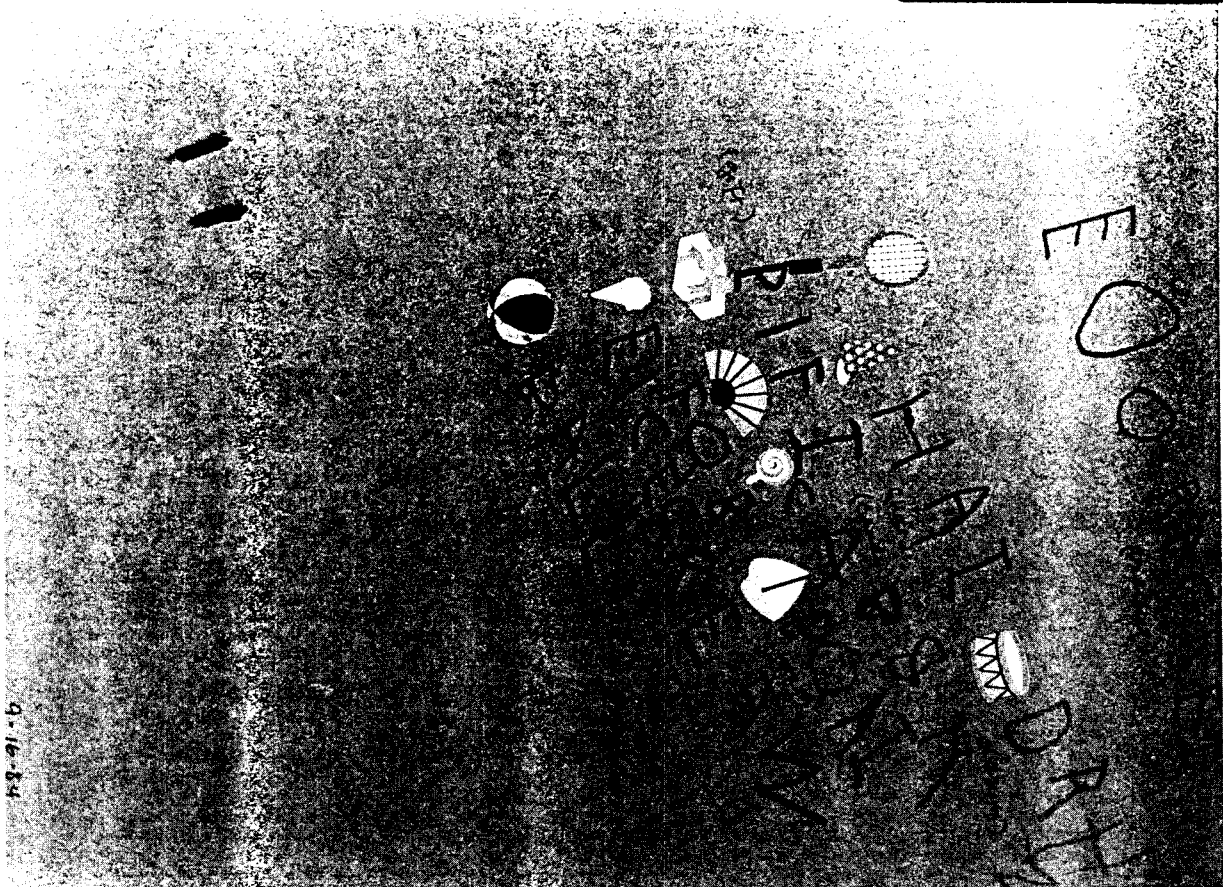


Figure 10.3. VV's attempts to write at age 4;9.

characters repeatedly to represent several configurations that share key features. She used the written *E* to represent *S* as well (in her written attempt for glasses), but the *E* used for the letter *s* has a small mark, or "diacritic," underneath it, perhaps to distinguish it from the following *e* letter. VV used *I* for *T* (as in "gift," "hat," and "racket") and for *S* ("purse"). All three hand-shapes involve closed fingers. She also used the letter *H* for *U*, as in "drum" and "purse."

Like hearing children learning to write, VV used the same written character for graphically similar letters. For example, *I* is used for both *i* and *t*, and *W* is used for both *w* and *m*. Her attempts at writing show that she draws from several different sources in constructing written language, including features of the hand configurations used in fingerspelling.

10.11 The Special Case of Fingerspelling

All the children in this study are highly verbal, capable of producing grammatically complex ASL sentences and participating in highly structured signed discourse. Their fingerspelled vocabulary is small, however, even though, like signed language, it is a manual system. Their ability to read fingerspelling outstrips their ability to produce fingerspelled words, but both vocabularies are far smaller than their sign vocabulary. Why are there such dramatic differences in competence between the two systems, given that both are present in the language repertoire of their parents and the other adults around them?

There are at least two possible explanations for the special difficulties of fingerspelling. First, the children have comparatively less exposure to fingerspelling than to signed material. The distribution of fingerspelled compared with signed items in adult discourse is low. As table 10.1 shows, fingerspelling accounts for as much as 12 percent or as little as 6 percent of all items manually produced. Adults fingerspell much less with children. Furthermore, table 10.2 shows that fingerspelled items are not equally represented across grammatical categories. Fingerspelling is made up disproportionately of nouns, and verbs rarely appear. Perhaps children have difficulty learning the system because so little of it is available to them.

Another possible explanation for these differences between fingerspelling and signing may lie in the structural properties of fingerspelling. The structure of fingerspelling—its units and how the units are constructed syntagmatically—is such that it is not a natural language, but instead is connected crucially to rules external to the system. Although, as this chapter demonstrates, children attempt to discover rules about fingerspelling by generalizing from the items they already know, for the most part deaf children cannot figure out from fingerspelling itself how to spell. Instead they must begin to learn about written English in order to increase their fingerspelled vocabulary. Al-

though they are able to produce the elements basic to fingerspelling, the selection of letters cannot be hypothesized from within the system but instead must be retrieved from without, that is, from English orthography.

10.12. Summary and Conclusions

This investigation into how deaf children learn to fingerspell has yielded a number of interesting observations. First, contrary to popular descriptions of fingerspelling, the system is not compartmentalized but interacts in specific ways with other language systems—not only with writing, but also with signing. Some of these interactions are popularly and informally known: initialized signs borrow from the system of fingerspelling and some alphabetic characters, for example, *C, I, J, L, M, N, O* are manually similar to their graphic representations. Battison's descriptions of fingerspelled signs have shown how fingerspelled items can lose their original stability and enter the sign lexicon in changed forms. However, a few other intriguing interactions have emerged from this study. Notably, with respect to nouns and verbs, fingerspelling is overwhelmingly composed of nouns, and verbs are very infrequent. Furthermore, fingerspelled items seem to fall into a limited set of possible categories. These newer observations suggest that fingerspelling and signed languages, both manual systems used by the signing community, co-exist in an unusual structural distribution that has yet to be explained.

A second key observation has been that learning to fingerspell does not merely involve learning to associate manual alphabetic configurations with print characters but entails learning the special interactions between fingerspelling and other language systems. This observation is not unexpected, given similar observations elsewhere about the relation between speaking and writing (e.g., Read 1975) or drawing and writing (e.g., Dyson 1986). Young deaf children's early efforts to fingerspell reflect attempts to generalize from within the system as well as outside it. System-internal attempts include those that try to coordinate knowledge about fingerspelling movement units and spelling, as in the case of children who remembered that there were doubled letters in the fingerspelled word but chose the wrong letter to double. System-external attempts are those that try to bring knowledge about signed language and English orthography into learning how to spell. Finally, deaf children's early attempts to spell show that, like hearing children, they form connections between spelling and other language systems; but unlike hearing children's, their connections appear to be much more orthographically based than speech based. These findings suggest that much of what takes place in language learning is not merely learning the primary language, but learning its interactions with other language systems in the environment.

11 Children's Memory for Sign and Fingerspelling in Relation to Production Rate and Sign Language Input

RACHEL I. MAYBERRY AND GLORIA S. WATERS

11.1 Introduction

How signed words are remembered in contrast to spoken words is not well understood. Some facts are known about adult memory for signed words, but how the skill develops is largely unknown. In this chapter we examine how children recall two different kinds of words in sign language—signs and fingerspelling—in order to answer two questions. First, does the model of working memory for spoken words proposed by Baddeley, Thomson, and Buchanan (1975) also explain how signed and fingerspelled words are remembered? Second, does the sign language input available to children who are learning sign language affect their development of memory for signed and fingerspelled words? The answers to these questions are complex. We find, first, that the sign language input available to children affects the rate at which they develop memory for both signed and fingerspelled words. Memory for fingerspelled words looks like memory for spoken words, but how signed words are remembered is unclear. Before describing our study, we discuss three issues that underlie its design: research findings about adult sign memory, the Baddeley, Thomson, and Buchanan (1975) model of working memory, and the heterogeneous language backgrounds of deaf children who sign.

For adults, some parallels have been found between memory for spoken words and signed words—that is, the signs of American Sign Language, or ASL. For example, when remembering spoken words, some of the intrusion errors speakers make are related to the phonology of the stimuli they are trying to recall. This shows that speakers use a phonological code in recall. Similarly, when remembering signs, some of the intrusion errors signers make are related to the phonology (or formational parameters) of the stimuli they are trying to recall. This suggests that signers, like speakers, also use a "pho-

The research reported here was supported in part by a grant from the National Institutes of Health to Rachel Mayberry (NS20142) and the University of Chicago (where the work was carried out) through funds provided by the Spencer Foundation. We thank Rhonda Wodlinger-Cohen for her invaluable assistance in testing subjects and Beth Belenski and Drucilla Ronchen for their meticulous transcriptions. We are especially indebted to the children who made this research possible by participating in our studies with much good humor. Last, we thank three reviewers who shared thoughtful comments on an earlier version of this chapter.