

Variation in American Sign Language: The case of DEAF¹

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Variation in sign languages has been a neglected area of research in sociolinguistics. This article, part of a large-scale study of variation in American Sign Language (ASL) designed to redress that situation, examines variation in the form of the sign DEAF, which can be produced by moving the forefinger from ear to chin, from chin to ear, or by contacting the lower cheek. Multivariate analysis of more than 1600 tokens of DEAF extracted from sociolinguistic interviews with 207 signers residing in seven regions of the United States shows that both linguistic and social factors significantly constrain choice among the three variants. The analysis also illustrates patterns that parallel variation in spoken languages. However, despite the similarities to variation in spoken languages, we suggest that results for the regional patterning of variation are best explained by reference to Deaf history, particularly to changes in the status and use of ASL in deaf education.

KEYWORDS: American Sign Language, ASL, deaf, sign languages, variation

INTRODUCTION

The study of linguistic variation, beginning with Labov's early studies in New York (1966, 1969), has greatly enhanced our understanding of spoken languages. As the result of intensive work in numerous cities around the world, we now have a very clear idea of what kinds of phenomena are likely to vary systematically. In many languages, we know which variables are stable and which patterns of variation represent changes in progress. Moreover, in recent years, variationists have once again begun to focus on the relationship between the observed facts of linguistic variation in the speech community and formal linguistic theory (see, e.g. Guy 1997; Henry 1995; Nagy and Reynolds 1997).

Variation in sign languages, in contrast, has received considerably less attention than variation in spoken languages, and most of the studies undertaken to date have involved small numbers of participants in a limited number of geographical areas. Patrick and Metzger (1996), for example, reviewed fifty sociolinguistic studies of sign languages conducted between 1971 and 1994. They found that more than half of the studies involved 10 or fewer signers, and that one third included only one or two signers. Only nine studies involved 50 or more signers, and a number of these drew on the same data set. Disappointingly for variationists, Patrick and Metzger found that although the number of sociolinguistic studies of sign languages increased during the period they surveyed, the proportion of quantitative studies declined from approximately half during the period 1972 to 1982 to between one third and one quarter during the period 1983 to 1993. The percentage of studies involving large samples (50+ signers) also declined from 33 percent during the first period to a mere 6 percent during the latter period.

Given this state of affairs, the need for large-scale studies of sign languages is readily apparent. To date, however, sign language researchers have not worked with sufficiently representative data sets to examine fully the extent to which variation in sign languages is systematic, the nature of the constraints on the observed variation, and the ways that variation in sign languages is similar to or differs from variation in spoken languages. This article, part of a large-scale study of variation in American Sign Language (ASL), represents an initial attempt to fill a lacuna in the literature. Using a representative corpus of data from 207 signers located in seven different regions of the United States, we examine variation in the form of the sign DEAF,² which can be produced by moving the forefinger from ear to chin, from chin to ear, or by contacting the lower cheek. The results of multivariate analysis with VARBRUL (Rousseau and Sankoff 1978; Sankoff 1988), a specialized application of logistic regression, suggest that DEAF is a classic sociolinguistic variable, conditioned by multiple linguistic and social factors.

The paper is organized as follows. First, we briefly review Liddell and Johnson's (1989) phonological framework, which informs the analysis, and discuss the nature of the variable within this framework. We then present an account of the data collection, reduction, and coding. Next, we present the results of multivariate analysis. Finally, we examine several issues that arose in the analysis and discuss the implications of the results for the study of sign languages.

ASL SEGMENTAL PHONOLOGY

The fundamental perspective on the structure of signs has changed dramatically since the early studies of variation in ASL (see, e.g. Battison, Markowicz, and Woodward 1975; Woodward 1973a, 1973b, 1976). Stokoe's (1960) perspective, which shaped sign language studies from 1960 until quite recently, held that signs are composed of three basic parts or parameters, the location at

which the sign is produced, the handshape, and the movement. This view was summed up by Frishberg, who contrasted the nature of spoken and sign languages: ‘... the essential character of a language based on a sound signal is its sequential nature. The corresponding essential character of a language based on a visual signal is simultaneity’ (1975: 698). Over the past decade, however, the view that signs are characterized by simultaneity has begun to change. In Liddell and Johnson’s (1989) model, which we adopt here, signs are viewed as composed of hold and movement segments, sequentially produced, analogous to the consonants and vowels of spoken languages. Each segment is an articulatory bundle that includes the features of handshape, location, palm orientation, and nonmanual signals (facial expressions). For example, the citation, or dictionary, form of the sign DEAF consists of a sequence of a hold segment, a movement segment, and a hold segment (HMH). Figure 1 is a representation of DEAF in this framework.

While we recognize that there is considerable debate regarding the nature of these segments (see, e.g. Coulter 1992; Perlmutter 1992; Sandler 1992; Uyechi 1994), we regard the Liddell and Johnson framework as most suitable for the study of variation. As Liddell (1992) demonstrated, it allows not only for the efficient description of any individual sign, but also for an accurate account of phonological processes such as assimilation, metathesis, epenthesis, and segment deletion – processes that are central to variation in both spoken and sign languages.

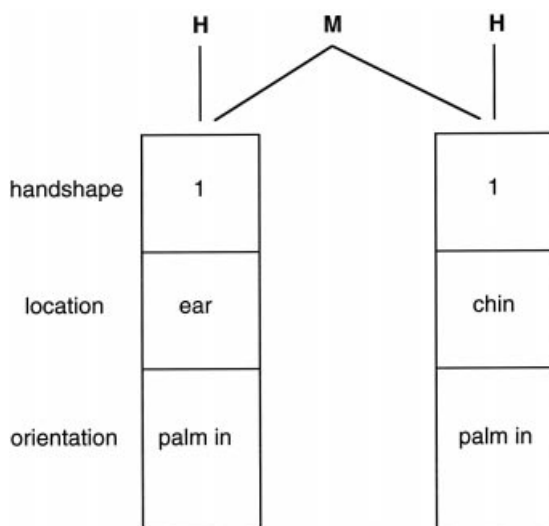


Figure 1: DEAF, citation form

THE LINGUISTIC VARIABLE

The sign DEAF, which consists of a hold, a movement, and a hold, has a '1' handshape, and the palm is generally oriented inward. In citation (standard) form, the sign begins just below the ear and ends near the corner of the mouth. It thus has two locations. A second variant, however, begins at the corner of the mouth and moves upward to the ear. A third variant simply contacts the lower cheek. Figures 2a, b, and c illustrate the three variants.

The ear-to-chin version (Figure 2a) of the sign is the citation form. The chin-to-ear version (Figure 2b) shows the process of metathesis, whereby the two hold segments are inverted. The contact-cheek version (Figure 2c) consists of a hold (H). Now, the issue is what promotes the production of a particular variant. The ear-to-chin variant and the chin-to-ear variant each have two locations and, because what varies is indeed the location, it is logical to suppose that something in the environment having to do with location constrains signers' choices between the two HMH variants. Indeed, Liddell and Johnson, in their discussion of metathesis, argued that the choice between the ear-to-chin and chin-to ear variants of DEAF involves a purely phonological process, which is conditioned by the location of the preceding sign:

A number of signs exchange the initial sequence of segments with a sequence of final segments in certain contexts that appear to be purely phonological. The sign DEAF is typical of such metathesizing signs. [The ear-to-chin] form of the sign typically occurs immediately following signs produced in higher facial areas. . . . However, if DEAF is immediately preceded by a sign in the lower facial regions (and perhaps other lower areas), the initial two segments are exchanged with the final two segments. (1989: 244–245)³

Our analysis of DEAF expands upon Lucas (1995), which examined 486 tokens, and examines a much larger data set in order to further test Liddell and Johnson's hypothesis about the effect of the location of the preceding sign on variation in the form of DEAF. We also examine the effects of a number of social factors as well as the effects of grammatical function, the location of the following sign, and discourse genre.

METHODS

Participants

As Padden and Humphries (1988) note, there is enormous language diversity within the American Deaf community, and there are also many deaf communities across the United States. Despite the diversity, there is definitely a shared sense of ASL as a language used by Deaf people all across the country. Accompanying this shared sense are shared perceptions that signing varies from region to region and that African American signers sign differently than white signers (Aramburo 1989; Woodward 1976). There is also a widespread

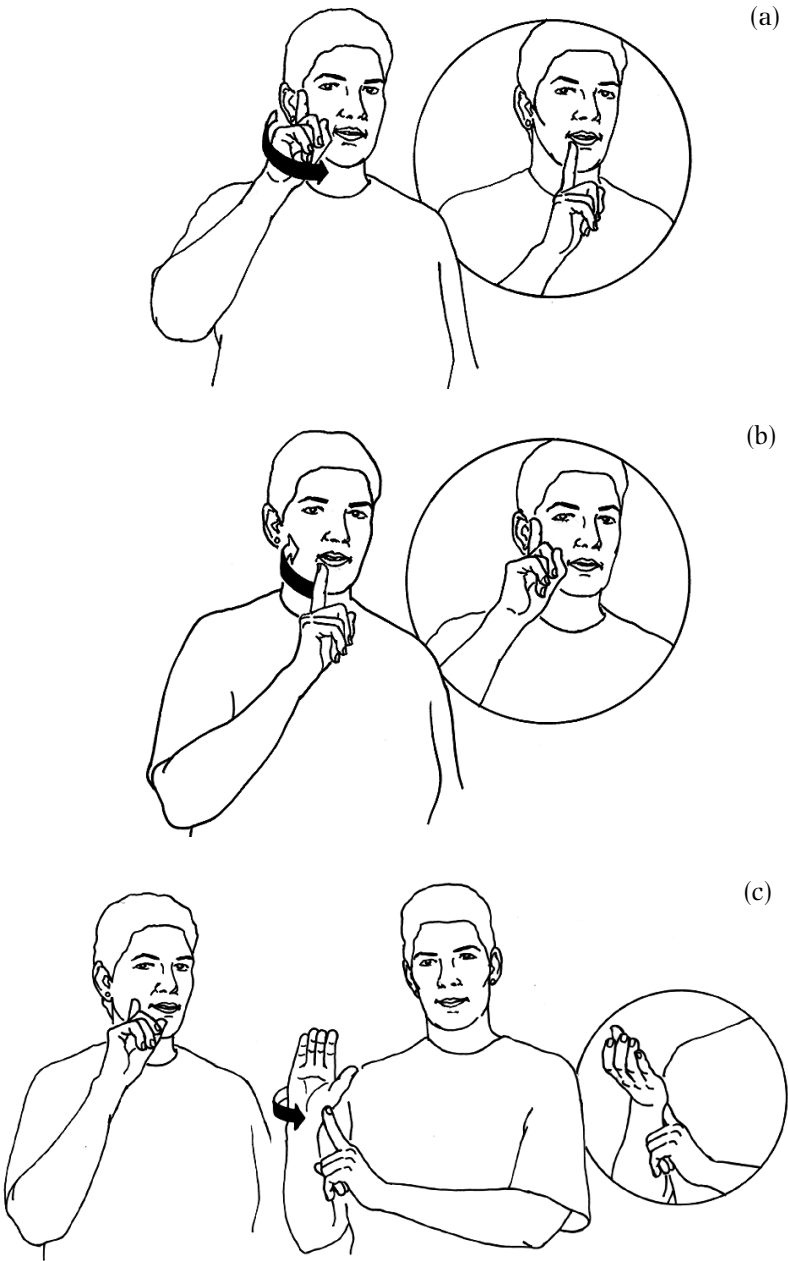


Figure 2: The three variants of DEAF: (a) DEAF, variant 1: ear to chin; (b) DEAF, variant 2: chin to ear; (c) DEAF, variant 3: contact cheek, in the compound DEAF CULTURE

belief that younger signers sign differently than older signers and that men and women differ in their signing. Finally, in the Deaf community, the perception is widespread that working-class Deaf people, whose educational backgrounds, employment patterns, and life experiences differ from those of middle-class Deaf professionals, sign differently as a function of social class. To investigate these perceptions and to create a representative corpus, data were collected during 1994 and 1995 at seven sites located in different regions of the United States: Staunton, Virginia; Frederick, Maryland; Boston, Massachusetts; Kansas City, Missouri/Olathe, Kansas;⁴ New Orleans, Louisiana; Fremont, California; Bellingham, Washington. All of the research sites have thriving communities of ASL users. In addition, residential schools for deaf children are located in five of the sites, Staunton, Frederick, Boston, Fremont, and Olathe. Six groups of ASL signers, all white, participated in Staunton, Frederick, and Bellingham. Six white groups and six African American groups participated in Boston, Fremont, Kansas City/Olathe, and New Orleans. In total, 207 signers participated. Their social and demographic characteristics are summarized in Table 1.

Following demographic studies of the Deaf community (e.g. Schein 1987; Schein and Delk 1974), working class participants were defined as individuals whose education did not extend past high school (in some cases, not past elementary school or eighth grade), and who were working in blue-collar jobs. In most cases, they had also lived all of their lives in the same place where they grew up and went to school. Middle class participants had completed college (and in many cases, a graduate degree) and were working in professional positions. They had often left their home areas to attend college, but had since returned to their places of origin and settled.

The division into age groups was designed to capture the effects of changes in language policies in deaf education. In the United States, the early 1970s witnessed changes from purely oral education in residential schools (with ASL being used in peer groups outside of the classroom) to mainstreaming programs and the use of Total Communication, which usually entailed speaking and signing simultaneously. More recently, ASL has been adopted as a medium of instruction in some areas, with English used for writing and reading. Participants who were 25 or younger at the time of data collection began school when a shift toward greater use of ASL in the classroom was occurring. Signers in the 26 to 54 age range had experienced a variety of language in education policies. Members of this age group had attended school at a time when ASL was beginning to be recognized as a natural language with a structure independent of English. Signers aged 55 and older attended residential schools when policies promoting oral communication prevailed.

Data collection

The approach to participants was informed by the work of Labov (1984) and Milroy (1987). Groups of three to seven individuals were assembled in each area

Table 1: Signer social and demographic characteristics

Site	Age			Social class		Gender		Ethnicity		Language Background	
	15–25	26–54	55+	Working	Middle	M	F	AA	W	ASL	Other
Boston, Massachusetts (n = 30)	9	12	9	17	13	15	15	11	19	5	25
Frederick, Maryland (n = 21)	7	6	8	11	10	11	10	–	21	6	15
Staunton, Virginia (n = 26)	5	11	10	15	11	12	14	–	26	5	21
New Orleans, Louisiana (n = 34)	7	15	12	20	14	17	17	13	21	8	26
Olathe, Kansas/Kansas City, Missouri (n = 42)	12	16	14	26	16	20	22	14	28	7	35
Fremont, California (n = 34)	6	16	12	18	16	16	18	15	19	11	23
Bellingham, Washington (n = 20)	6	7	7	9	11	12	8	–	20	3	17
Totals (n = 207)	52	83	72	116	91	103	104	53	154	45	162

by a contact person, a Deaf individual who lived in the area, possessed a good knowledge of the local community, and was a respected member of the community. These contact persons were similar to the 'brokers' described by Milroy, people who 'have contacts with large numbers of individuals' in the community (1987: 70). In some cases, the contact persons also participated in data collection sessions. Sessions were divided into three parts. The first consisted of approximately one hour of free conversation among the participants, without the researchers present. In the second part, two participants were selected from each group and interviewed in depth by deaf researchers about their backgrounds, their social networks, and their patterns of language use. The concluding part, which is reported on elsewhere (Lucas, Valli, Schatz, Rose, Bayley, Wulf and Dudis forthcoming), involved an elicitation task. All participants were shown the same set of thirty-three pictures and asked to supply signs for the objects or actions represented in the pictures. All sessions were videotaped.

Previous research has shown that Deaf signers tend to be very sensitive to the audiological status of the interviewer (Lucas and Valli 1992). This sensitivity is manifested by rapid switching from ASL to Signed English or contact signing in the presence of a hearing person.⁵ To ensure the consistent elicitation of ASL, the participants were only interviewed by deaf members of the research team. In addition, because many ASL signers tend to be sensitive to the ethnicity of the interviewer (Lucas and Valli 1992), all participants were interviewed by a member of the same ethnic group.

Data reduction and coding

As data were being collected, a cataloguing system was developed to provide easy access to the data tapes. A computer database was developed to store a wide variety of information about the videotapes. The database includes details as to when and where each group was interviewed, as well as information about the persons who appear in each tape (names, ages, educational backgrounds, occupations, patterns of language use), detailed information about observed phonological, lexical, morphological, and syntactic variation, and observations about other linguistic features of ASL not necessarily related to variation. The information about the linguistic variables includes identification of the specific variable observed,⁶ a brief description of the nature of the variation, the context in which the variable occurred, and the code for the signer who produced the variable.

All tokens of DEAF that appeared in spontaneous talk in the group sessions and the interviews were extracted from the database for coding for VARBRUL analysis, resulting in a total of 1618 tokens. The form of each token was noted, and a sufficient portion of the surrounding discourse (usually the entire utterance in which the token appeared) was transcribed to indicate the grammatical function of the token and the phonetic characteristics of the

preceding and following signs. Tokens were coded to test the possible effects of a broad range of sociodemographic and linguistic factors. Sociodemographic factors included region, age (15–25, 26–54, 55+), gender, ethnicity (African American, white), class (working, middle), and language background (native ASL, other). ‘Native ASL’ refers to participants whose parents were deaf signers of ASL and who therefore acquired ASL as a first language; ‘other’ refers to participants whose parents were hearing and, in most cases, non-signers. These participants acquired ASL from peers and other deaf adults, often in a residential school setting. We wanted to see if this difference in language background was a factor in the variation we observed.

The sample of 207 signers provided adequate representation for all social categories except middle class African Americans over 54. As a consequence of double discrimination, very few persons in this category achieved middle class status until recent years. We were unable to locate any persons in this category for the study.

With respect to the linguistic factors, our coding scheme was designed to test the effect of grammatical function, which Lucas’s (1995) pilot study found to be the first order linguistic constraint on variation in the form of DEAF. We also wished to test previous claims about the effects of the location of the preceding and following signs. Finally, because sociolinguistic research has shown that highly involved narratives of personal experience tend to favor the use of the vernacular (Labov 1972), we also coded the discourse genre in which DEAF appears. In addition to the dependent variable and the sociodemographic factors, we coded for fourteen linguistic factors, divided into four factor groups:

1. Grammatical function of DEAF:
 - noun, e.g. DEAF UNDERSTAND (‘Deaf people understand’);
 - adjective, e.g. DEAF CAT;
 - predicate adjective, e.g. PRO. 1 DEAF (‘I am deaf’);
 - compound, e.g. DEAF[^]WORLD, DEAF[^]CULTURE.⁷
2. Location of the preceding segment: high (at ear or above), middle (between ear and chin), low (chin or below), pause.
3. Location of the following segment: high, middle, low, pause.
4. Genre of text in which DEAF occurs: conversation, narrative.

An interrater reliability study was completed early in the coding process. Two of the authors, Lucas and Rose, coded a sample of tokens independently and achieved an interrater reliability rate of .92 for all tokens and all factors. Coding disagreements were resolved through reviewing the videotapes. Subsequently, Lucas, the principal investigator for the larger project of which this article forms a part, monitored the coding closely to ensure consistency.

RESULTS

Results of multivariate analysis of 1618 tokens with GoldVarb (Rand and Sankoff 1990), a Macintosh version of VARBRUL (Sankoff 1988), indicated that variation in the form of DEAF is systematic and conditioned by multiple linguistic and social factors, including grammatical function, the location of the following segment, discourse genre, age, and region. The results confirmed the earlier finding of Lucas (1995), which showed that the grammatical function of DEAF, rather than the features of the preceding or following sign, is the main linguistic constraint on variation. For the choice between citation and non-citation forms, among the linguistic factors, only grammatical function and discourse genre proved to be statistically significant. For the choice between the two non-citation forms, both the grammatical function of DEAF and the location of the following segment proved significant. Among the social factors, only age and region contributed significantly to the observed variation. The other non-linguistic factors – ethnicity, gender, language background, and social class – failed to reach statistical significance and will not be discussed further.

For DEAF, non-citation forms were far more common than citation forms. Of the 1618 tokens of DEAF analyzed in this study, only 500, or 31 percent, were in citation form. Of the non-citation forms, 889 tokens, or 55 percent, were chin-to-ear, and 229, or 14 percent, were contact-cheek. We now turn to the VARBRUL analyses, with particular attention to the relationship of the three variants to one another.

Citation vs. non-citation form

In the initial quantitative analysis, the two non-citation (–cf) variants (chin-to-ear, contact-cheek) were collapsed and –cf defined as the application value.⁸ Among the linguistic factors considered in this study, only grammatical function and discourse genre significantly constrained signers' choice between citation and non-citation forms. VARBRUL results for the linguistic factors are shown in Table 2. The table also includes the input probability (p_o), the likelihood that signers will choose the application value, regardless of the presence or absence of any other factor.

As shown in Table 2, compounds favored ($p = .660$) and predicate adjectives disfavored non-citation forms (–cf) ($p = .370$). Nouns and other adjectives, which comprise the great majority of tokens, had very little effect on the choice between citation and non-citation forms ($p = .515$).

The results showing that compounds favor and predicate adjectives disfavor –cf may be readily accounted for. As discussed in more detail in the following section, compounds strongly favored one –cf variant, contact-cheek. As for predicate adjectives, Lucas suggested that these forms, coming at the end of a sentence, are normally stressed (1995: 21). Thus, like stressed syllables in

Table 2: VARBRUL analysis of DEAF: +cf vs. -cf (application value: -cf)

Factor group	Factor	Weight	Percentage	N
Grammatical function	Noun, adjective	.515	71	1063
	Predicate adjective	.370	58	361
	Compound	.660	81	194
Discourse genre	Conversation	.489	69	1489
	Narrative	.628	74	129
Total	Input/ p_o	.743	69	1618

$\chi^2/\text{cell} = 1.2952$, all factor groups significant at $p < .05$

spoken languages, they tend to favor use of the standard variant (cf. Labov 1989 for a discussion of the effect of syllable stress on -t,d deletion in English).

Turning to the discourse genre, -cf forms were favored in narratives ($p = .628$). Conversation, however, had only a minimal effect on signers' use of -cf forms ($p = .489$). Although the difference between the effect of conversation and narrative discourse on signers' choice of variant was significant, this finding should be treated with caution. As Table 2 shows, the number of tokens of the two factors in this group was highly unequal, with 92 percent occurring in conversations. Such a highly unequal distribution of tokens suggests that the results may not be fully reliable because there is a very substantial overlap between one factor, conversation, and the input probability (Guy 1988). Finally, as in Lucas's (1995) study, neither the location of the preceding nor of the following sign significantly affected signers' choices between citation and non-citation forms.

Among the social factors, the results for age and region reveal a complex pattern. In the initial analysis, we treated the three age groups and the seven sites where the data were collected as separate factor groups. However, as is often the case with social factors (Sankoff 1988; Young and Bayley 1996), the results of the initial runs revealed considerable interaction between age and region with respect to the choice of a variant of DEAF. A closer examination of the data showed that in some regions, the oldest signers used the highest percentage of citation forms, while the youngest used the lowest percentage. In other regions, signers aged 26 to 54 were most likely to use citation forms, while the oldest and the youngest signers used a correspondingly greater percentage of non-citation forms. In order to capture the variability by age and region and to better understand the direction of change within regions, we recoded the data and created a combined factor group with each age group within a region treated as a separate factor. This procedure greatly improved the fit between the statistical model and the data and resulted in an acceptable chi-square per cell of 1.2952 for the revised model. Table 3 shows results for age and region.

Although the substitution of a single age by region factor group for two

Table 3: VARBRUL analysis of DEAF, +cf vs. -cf: age by region (application value, -cf)

	15–25			26–54			55+			Total	
	VARBRUL Weight	%	N	VARBRUL Weight	%	N	VARBRUL Weight	%	N	%	N
Massachusetts	.264	54	63	.281	46	169	.097	24	80	41	312
Maryland	.108	27	26	.458	71	48	.678	83	30	66	104
Virginia	.656	86	22	.499	74	27	.874	96	48	85	97
Louisiana	.794	90	52	.415	68	158	.547	76	51	74	261
Kansas/Missouri	.573	78	122	.830	93	138	.641	82	87	85	347
California	.597	82	55	.253	48	183	.776	90	101	66	339
Washington	.779	92	59	.306	55	47	.815	92	52	81	158
Total		69	399		62	770		76	449	69	1618

groups in which age and region were analyzed separately proved successful in dealing with interactions, the results reported in Table 3 do not illustrate an obvious general direction of change or a cohort effect, nor do they show similarities between nearby regions. For example, in Massachusetts, signers aged 55 and older were very unlikely to use non-citation forms of DEAF ($p = .097$). While non-citation forms were also disfavored by Massachusetts signers aged 15 to 25 and 26 to 54, both of these age groups were considerably more likely to choose non-citation forms than the oldest Massachusetts signers. In contrast to Massachusetts, among Maryland signers, the likelihood of use of non-citation forms decreased with age. The youngest Maryland signers were most similar to the oldest Massachusetts signers. Nearby Virginia illustrates yet another pattern. Although the Virginia results for signers aged 26 to 54 and 55 and older agree with the Maryland results in showing that signers in the middle age group were less likely than the oldest signers to choose non-citation forms, the results for the youngest group illustrate a sharp difference. In contrast to Maryland, where the youngest signers were very unlikely to use non-citation forms, the youngest Virginia signers favored such forms. Finally, the west coast results did pattern in the same way. In both northern California and Washington state, non-citation forms were disfavored by signers in the 26 to 54 age group and favored by signers in the 15 to 25 and over 55 groups.

As might be expected in a factor group containing more than 20 factors, the results of the age and region group are complex. However, the results do allow us to identify one predominant pattern, shared by four sites, and three other patterns, that each characterize only one site. In California, Louisiana, Virginia, and Washington state, signers in the 26 to 54 year old group are less likely to choose non-citation forms than either the youngest or the oldest signers. Figure 3 illustrates the most common pattern.

In contrast to the pattern shown in Figure 3, among Kansas/Missouri signers, 26 to 54 year olds were more likely to use a non-citation form of DEAF than either their younger or older counterparts. Finally, as we have seen, the oldest signers in Massachusetts and the youngest signers in Maryland were least likely to use non-citation forms of the variable. Figure 4 illustrates the patterns that occurred in a single region only.

The effects of age and region on signers' choices between citation and non-citation forms, particularly the dominant pattern shown in Figure 3, may be a reflection of the role of residential schools for the Deaf in either suppressing or facilitating ASL. The history of these schools explains why this should be the case. The first school for the deaf was established in Hartford, Connecticut in 1817 by Thomas Hopkins Gallaudet and Laurent Clerc, a deaf French teacher – the Connecticut Asylum for the Education and Instruction of Deaf and Dumb Persons, now known as the American School for the Deaf. The medium of instruction was sign language, probably French Sign Language, which Clerc brought with him, combined with elements of the various home sign systems that the children brought with them to the school. For the first forty years of

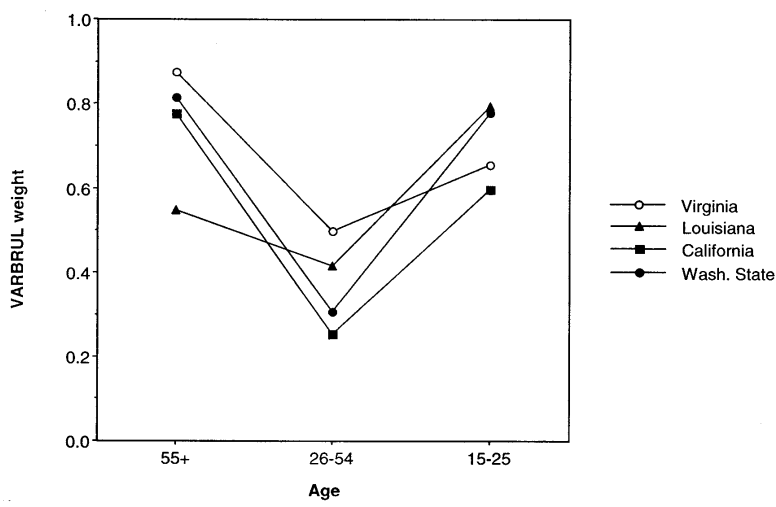


Figure 3: VARBRUL factor values for non-citation forms of DEAF by age and region: Dominant pattern

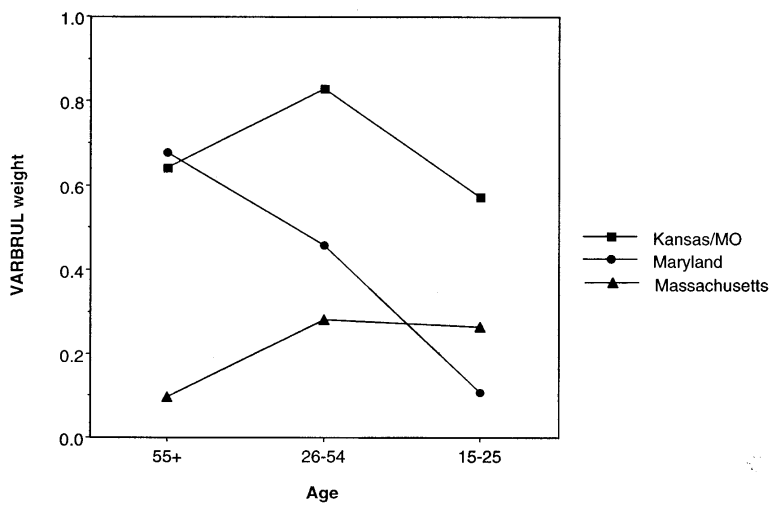


Figure 4: VARBRUL factor values for non-citation forms of DEAF by age and region: Massachusetts, Maryland, and Kansas/Missouri

deaf education in the United States, there were many deaf teachers in the residential schools established across the country.

Following the congress of deaf educators held in Milan, Italy in 1880, the climate for sign language changed and there was a fairly rapid shift to pure oralism. The use of sign language was widely forbidden in classrooms, most deaf teachers lost their jobs, and educating the deaf became work for hearing people. As Lane, Hoffmeister, and Bahan state, 'In 1867 there were twenty-six American institutions for the education of Deaf children, and all taught in ASL as far as we know; by 1907 there were 139, and none did' (1996: 62). ASL survived by being used in the residential quarters of the schools and by being passed by children from Deaf families to other children at the schools. The residential schools thus became crucibles of ASL and Deaf culture. In the early 1970s, educators slowly began to realize that oralism as a means of education was a failure and that deaf children were reading at levels well below their hearing peers. Educators then began to propose a variety of manual codes for English. The idea was that English could be simultaneously represented on the hands and by the mouth, thus providing children with a visual model of the language. This approach failed to improve the situation, and educators are slowly coming to the view that deaf children need early access to a natural language that they can understand, i.e. ASL. Bilingual programs that provide early acquisition of ASL along with literacy training in English (with optional speech training) are now beginning to be developed. These kinds of programs are not limited to the United States and are being implemented all over the world in a variety of sign languages (see, e.g. Oviedo 1996, Padden 1998).

The history of deaf education had a direct impact on the recognition of ASL as a language, independent in structure from English. Before 1880, while opponents did question its status, ASL was accepted widely as the medium of instruction. Between 1880 and 1960, however, the status of ASL was very fragile, even among its users. In 1960, William C. Stokoe published the first linguistic description of ASL (Stokoe 1960) and the recognition of ASL as a viable natural language slowly began to grow. We suggest that the history of deaf education and the recognition of ASL are reflected in the patterns of variation that we see. Specifically, in the majority of sites studied, older signers use more non-citation forms. Many of them were attending residential schools at a time when ASL was actively suppressed and forbidden. While they were certainly fluent users of the language, there was very little metalinguistic awareness or prescriptivism accompanying that use. Indeed, many of the older signers in our study could not provide a name for their language – ASL – as the two younger groups could. Rather, many of the older signers still referred to their fluent language production simply as 'sign'. By contrast, the 25 to 54 year-old signers in the sample were in school at the time when ASL was beginning to be recognized and valued as a language separate from English. ASL was still not accepted in classrooms but there was

a rapidly growing awareness in the Deaf community of the need for recognition. The first dictionary of ASL was published in the mid-1960s (Stokoe, Casterline and Croneberg 1965). In the late 1960s and early 1970s, formal instruction in sign language began, along with the preparation of teaching materials. This new awareness of the status of ASL helps explain the preference among the 25 to 54 year-old signers in the majority of sites examined for the citation forms of DEAF. The prescriptivism seen here in the use of citation forms may be regarded as a tool in maintaining the hard-won recognition of ASL. Finally, the youngest signers in the sample all attended school at a time when for the most part, the status of ASL was no longer in question. The change in the status of ASL may explain the more frequent use of non-citation forms by younger signers. The status of the language is not threatened by the use of non-citation forms. This would seem to account for the general patterns that we see. Deviations from this pattern, such as the preference in the older Massachusetts signers and the youngest Maryland signers for citation forms, may be explained by the specific history of those communities, and this is what we are exploring now.⁹

Other policy changes in the education of the Deaf may also play a role in the patterns exhibited in the data. For example, in recent years, educational policies in many states have favored placing Deaf children in mainstream public school classes (Ramsey 1997). As a result of such policies, children have fewer opportunities to interact on a daily basis with communities of ASL users. In addition, the Deaf community in the United States has long been characterized by its own social institutions and by dense social networks (Baynton 1996).

The choice between two non-citation forms

In the second stage of the analysis, we examined the choice between two non-citation forms of DEAF, chin-to-ear and contact-cheek, again using the coding scheme outlined above. As in the analysis of citation vs. non-citation forms, the grammatical category proved to be the first order linguistic constraint in the analysis of the chin-to-ear and contact-cheek variants. The contact-cheek variant was strongly favored in compounds ($p = .850$) and disfavored in predicate adjectives ($p = .338$), with nouns and other adjectives having intermediate values. Table 4 shows the results for the linguistic factors in the analysis of the two -cf forms, with contact-cheek defined as the application value.

Unlike the analysis of citation vs. non-citation forms, the analysis that included only the two non-citation variants did select a significant phonological constraint. As Table 4 shows, the location of the following sign significantly affected signers' choice between the chin-to-ear and contact-cheek variants. When the following sign was between the ear and chin (middle) or null (a pause), contact-cheek was disfavored. When the following sign was at the ear or

Table 4: VARBRUL analysis of DEAF, linguistic factors: chin-to-ear vs. contact-cheek (application value: contact-cheek)

Factor group	Factor	Weight	Percentage	N
Grammatical category	Noun	.490	17	411
	Adjective	.403	10	191
	Predicate adjective	.338	12	299
	Compound	.850	56	151
Following sign	Low	.579	25	756
	Middle	.273	7	134
	High	.590	18	51
	Pause	.240	5	111
Total	Input/ p_o	.142	20	1052

$\chi^2/\text{cell} = 1.0294$; all factor groups significant at $p < .05$

above or at the level of the chin or below, contact-cheek was favored. These results may best be explained by the need to maintain a distinction between DEAF and the following sign. Thus, the contact-cheek variant may be freely used if the location of the following sign is at the ear or above, or at the chin or below (i.e. if the location of the following sign is somewhere other than at the cheek). Instances of the contact-cheek variant before another sign with a location on the cheek were very rare, comprising only 7 percent of the tokens in this phonological environment. Examples of the contact-cheek variant before a pause were even rarer, and comprised only 5 percent of the tokens. Finally, the fact that a following pause strongly disfavored the contact-cheek variant may be explained in two ways. First, as we have seen, compounds were the most favorable grammatical category for the contact-cheek variant, and the first element of a compound is never followed by a pause, but rather by the second element of the compound. Second, pauses normally occur at the end of a sentence or phrase. In ASL, this tends to be a stressed position. As noted in the previous section, at least in spoken languages, stressed elements are less subject to deletion than unstressed elements.

Turning to the non-linguistic factors, the same factor groups, age and region, reached statistical significance in the analysis of the two non-citation forms as in the analysis that included both citation and non-citation forms. Although the results of an analysis with the age and region factors in separate groups did not indicate interaction between these two factor groups to the degree evidenced in the analysis of the choice between citation and non-citation variants, analysis that combined age and regions provided a better fit. As in the earlier analysis of citation vs. non-citation forms, the results by age and region of the analysis of the two non-citation forms did not show a clear direction of change that transcends different regions. In Massachusetts, for example, the oldest signers

were very unlikely to use a non-citation form of DEAF. However, when they did choose a non-citation form, in our data they categorically chose the contact-cheek variant. Massachusetts signers aged 26 to 54 also showed a preference for the contact-cheek variant when choosing between the two non-citation variants ($p = .806$); however, their use of the contact-cheek form was not categorical. In contrast, the youngest Massachusetts participants disfavored the contact-cheek variant ($p = .284$). Table 5 shows the results for the choice between the two non-citation forms by age and region.

The patterns of variation in Maryland and Virginia differed from one another and from Massachusetts and other sites. Maryland signers showed relatively little difference between the younger and middle groups, with VARBRUL weights ranging from .526 for the youngest signers to .586 for the middle group. Among the Virginians, we found the reverse of the Massachusetts pattern, with the contact-cheek variant favored by the youngest group, slightly favored by the middle group, and, as in Maryland, strongly disfavored by signers aged 55 and older. Our second southern site, Louisiana, showed still another pattern. In Louisiana, the contact-cheek variant was categorically absent among the youngest signers in this study, favored (but not strongly) among the 26 to 54 age group, and favored among the oldest signers. When we move further west, we find yet other patterns. In Kansas, Missouri, and Washington State, signers in the 26 to 54 age group were the least likely to use the contact-cheek variant of DEAF. In California, signers in this age group were the most likely to use the contact-cheek variant. Finally, as in the case of the analysis of citation vs. non-citation forms, we suspect that the role of deaf schools in the various areas, and the connections of deaf schools in different regions to one another, may explain some of these findings.

DISCUSSION

Analytical issues

We now turn to a problem that has arisen in the analysis of DEAF, but that may potentially arise in any study where the variable under examination has three or more surface alternants (cf. Guy and Bayley 1995: 158–159). With binary rules consisting of an input and an output, how do we get three surface forms? A number of scenarios is possible, depending on our analytical decisions. The first of these decisions concerns which of the three surface forms is basic or underlying. In the case of DEAF, it is possible to postulate any of the three surface alternants, or some abstract representation, giving four starting points for the analysis. (Contact-cheek, the least frequently occurring variant, is admittedly an unlikely candidate, if only on the grounds of its limited distribution.) The next step is to decide whether the rules are to be ordered, with some forms serving as intermediate steps in the derivation of other forms,

Table 5: VARBRUL analysis of DEAF, chin-to-ear vs. contact cheek: age by region (application value: contact cheek)

	15–25			26–54			55+			Total	
	Weight	%	N	Weight	%	N	Weight	%	N	%	N
Massachusetts	.284	12	34	.806	36	74	–	100	(19)	29	108
Maryland	.526	29	7	.586	29	34	.221	4	25	20	66
Virginia	.617	37	19	.552	20	20	.105	2	46	12	85
Louisiana	–	0	(47)	.568	23	108	.596	23	39	23	147
Kansas/Missouri	.684	33	95	.368	14	129	.424	11	71	19	295
California	.400	16	45	.600	22	87	.521	15	91	18	223
Washington	.548	22	54	.147	4	26	.574	21	48	18	158
Total		25	254		22	478		13	320	20	1052

Note: To avoid knockouts, numbers in parentheses were not included in the VARBRUL analysis, nor are they included in the token totals or percentages.

or unordered (cf. the models in Sankoff and Rousseau 1989). Some possible models for the derivation of the different forms of DEAF are shown in Table 6.

With these options, as well as others we might list, how do we conduct the analysis? If we postulate +cf (ear-to-chin) as the underlying form and a series of ordered rules as in 6a, the analysis we have reported above would seem to be correct. That is, our first step involves a binomial choice between +cf and -cf, whether the -cf alternative eventually surfaces as chin-to-ear or contact-cheek. In the second stage, however, +cf forms are no longer involved. Rather, we again have a binomial choice, this time between the two -cf variants. The ordered set of rules in 6b implies a similar set of binomial choices. However, if we were to postulate chin-to-ear as the underlying form, perhaps on the grounds of its greater frequency of occurrence, our results would be substantially different. The first stage would involve a choice between the -cf form chin-to-ear on one side, and -cf contact-cheek and +cf ear-to-chin on the other. In the second stage, all occurrences of chin-to-ear would be excluded, and the choice would be between contact-cheek and ear-to-chin. As Table 6 suggests, still other scenarios are possible, and these scenarios imply other types of analysis. The unordered rules in 6c and 6d, for example, might be best tested in a one stage trinomial analysis.

Given these scenarios, all of which may be tried using the analytical tools that have long been available in sociolinguistics, which should we choose? We are tempted to offer a quantitative answer, in line with the research tradition that goes back to Labov's (1969) copula study. However, a quantitative answer alone will not suffice. The various rule possibilities to arrive at the three variants of DEAF all imply different theoretical models. In the analysis above, we assumed +cf as the underlying form, both because +cf is the form normally offered by ASL native signers when asked for the sign for DEAF and because +cf is more widely distributed across linguistic environments for signers of all ages in all regions of the United States. For example, when they chose a -cf variant, in our data Massachusetts signers over 55 always chose contact-cheek rather than chin-to-ear. Conversely, when the young Louisiana signers in our sample

Table 6: Derivation of DEAF: possible models of ordered and unordered rules

Ordered Rules	Unordered rules
a. Underlying form: ear-to-chin 1. ear-to-chin → chin-to-ear 2. chin-to-ear → contact-cheek	c. Underlying form: ear-to-chin 1. ear-to-chin → chin-to-ear 2. ear-to-chin → contact-cheek
b. Underlying form: chin-to-ear 1. chin-to-ear → ear-to-chin 2. ear-to-chin → contact-cheek	d. Underlying form: DEAF 1. [DEAF] → ear-to-chin 2. [DEAF] → chin-to-ear 3. [DEAF] → contact-cheek

chose a –cf variant, they always chose chin-to-ear rather than contact-cheek. However, both older Massachusetts signers and young Louisianans used the +cf variant.

Additional evidence for the choice of +cf, ear-to-chin, as the underlying form comes from historical sources. In Sicard's early nineteenth century dictionary of French Sign Language, one of the main sources of ASL, the form of the compound sign *sourd-muet* (deaf-mute) is ear-to-chin (1808: 331–332). From the early twentieth century, we have both print and filmed evidence that the ear-to-chin variant was the preferred form of DEAF in ASL. In an early twentieth century manual of signs, for example, J. Schuyler Long, head teacher of the Council Bluffs, Iowa school for the deaf, described how DEAF should be signed: 'Place the end of the forefinger of the right "G" hand at the right ear and then carry it around and place it against the mouth' (1910: 142). Filmed evidence, some of it dating back to 1910, is also abundant because the U.S. National Association for the Deaf (NAD) was quick to take advantage of the possibilities offered by the new medium. From 1910 to 1920, the NAD produced a variety of films in ASL. In these early films, the ear-to-chin form comprised the great majority of examples of DEAF used by deaf signers (Van Manen 1997).

Our choice of a model of rule ordering was also motivated by a desire to understand whether the same processes that underlie phonological variation in spoken languages underlie variation in sign languages such as ASL. The relationship between the three variants of DEAF postulated in 6a involves two clearly understood processes, metathesis and deletion. Thus, in the scenario selected here, we assume that the underlying form is +cf (ear-to-chin). Some of these forms surface as +cf, while a certain proportion (69% in this study) undergo metathesis. Tokens that have not undergone metathesis are not available for the second stage of the process. Of the forms that have undergone metathesis, some surface as chin-to-ear, while a certain proportion (20% in this study) undergo a further process of deletion of the second element and surface as contact-cheek. As it turns out, deletion is far more common in compounds than in other grammatical categories. Fully 45 percent of the tokens of DEAF in compounds are contact-cheek, compared to 13 percent of nouns, 9 percent of non-predicate adjectives, and only 6 percent of predicate adjectives. That is, we find deletion where we would expect it most in any language, whether spoken or signed.

A further motivation for our choice of a rule ordering system involving a sequence of variable metathesis followed by variable deletion is based on an analysis of the structure of ASL compounds in which DEAF is the first element, as occurs with the signs CULTURE, RESIDENTIAL SCHOOL, COMMUNITY, FAMILY, CLUB, MAN, PARENTS, BLIND, PERSON, and PEOPLE, among others. These are essentially lexicalized compounds. They conform to the structure of lexicalized compounds in that their whole is more than the sum of their parts. That is, they have a meaning that is not available from the simple juxtaposition of two lexical items. For example, DEAF RESIDENTIAL SCHOOL

refers specifically to the state institutions in which ASL was typically forbidden in the classroom but flourished among students in the dorms, places seen as crucibles of DEAF⁺CULTURE, a set of values, attitudes, and behaviors understood and shared by Deaf people. These lexicalized compounds function as bounded units, as do the compounds of spoken languages. According to Liddell and Johnson's (1989) account of compound formation in ASL, part of that lexicalization may include retaining the initial contacting hold in the first sign of the compound while deleting the other segments that make up the sign. The contact-cheek variant of DEAF, then, is most likely the result of structural reduction occurring in the compounding process.

Finally we offer an additional observation to support the view that the deletion process of which contact-cheek is the result occurs only after metathesis of the hold segments of DEAF. If contact-cheek is the result of reduction as assumed in our model, it would have to be the reduction of the chin-to-ear variant. Were it the reduction of the ear-to-chin form, we would expect it to be produced near the ear (i.e., to retain the first contact hold). However, it is not. In compounds involving DEAF in which the first sign has been reduced, that sign is always produced near the corner of the mouth.

Variation and ASL linguistics

Perhaps the most surprising result of our analyses is the very strong influence of grammatical factors on patterns of variation. As we have seen, when we perform variable rule analysis on all the tokens, with *-cf* defined as including both chin-to-ear and contact-cheek forms, the grammatical category and speech genre are the only significant linguistic constraints. The locations of the preceding and following signs have no significant effect. Liddell and Johnson's (1989) suggestion that the ear-to-chin form 'typically' follows signs produced in higher facial areas, while the chin-to-ear form is 'immediately preceded by a sign in the lower facial regions' finds no empirical support in this study of more than 200 signers. Moreover, the grammatical category and speech genre remain the only significant linguistic constraints in the analysis even if we accept Liddell and Johnson's restricted definition of the DEAF variable and exclude contact-cheek tokens.¹⁰

Why should the location of the preceding and following signs have failed to affect signers' choice between *+cf* and *-cf* forms of DEAF? One possibility is that the grammatical constraints are a synchronic reflex of a change in progress that originates in compounds and then spreads to nouns and adjectives and finally to predicates. A change from ear-to-chin to chin-to-ear, beginning with compounds, a grammatical class that is most subject to change, is arguably a shift in the direction of greater ease of production. Such a change would conform to Kroch's (1978) model of change from below, which, at least in the case of consonants, tends to greater ease of articulation. This explanation is supported by the fact that there exist a number of ASL

signs that move from chin to ear in their citation form. Only two of these, however, clearly allow metathesis. They are HEAD and MOTHER^FATHER ('parents').¹¹ Metathesis is not allowed by other common signs with a phonological structure like DEAF, consisting of a hold, a movement, and a hold (e.g. INDIAN, HOME, YESTERDAY). The fact that metathesis is not allowed by most signs whose citation form is chin-to-ear, that is, signs that move up, while it is allowed by DEAF, where the citation form moves down, suggests that chin to ear movement is the less marked sequence. DEAF, then, may be undergoing a change from a more marked to a less marked form which is characterized by greater ease of production.

CONCLUSION

This study has examined variation in the sign DEAF. The results of multivariate analysis of a large number of tokens collected in sociolinguistic interviews and conversations with a broadly representative sample of more than 200 signers suggest that DEAF is a classic sociolinguistic variable, constrained by linguistic and social factors. Variation between citation and non-citation forms is constrained by the grammatical category, discourse genre, and age by region; variation between the two non-citation forms is constrained by the location of the following sign as well as by the grammatical category and age by region. Finally, although we have coded for the social factors that are commonly studied by sociolinguists (gender, ethnicity, class, age, region, native vs. non-native signer), we suggest that results for the non-linguistic factors that achieved statistical significance (regional and age patterns) are best explained by reference to Deaf history, particularly the role of ASL in deaf education.

NOTES

1. This research was supported by U.S. National Science Foundation Grants SBR #9310116 and SBR #9709522 to Gallaudet University (Ceil Lucas, Principal Investigator). Clayton Valli, Alyssa Wulf, Alison Jacoby, Leslie Saline, Susan Schatz, and Ruth Reed assisted with data collection, transcription and coding. Lois Lehman-Lenderman provided the illustrations of the forms of DEAF in Figures 2a, b and c and M. J. Bienvenu served as the model. We thank Gregory Guy, Peter Patrick, and Walt Wolfram, who provided valuable advice at various points in the data collection and analysis. Special thanks to the many Deaf individuals who generously shared with us the richness of their language and experience.
2. In accord with convention, English glosses of ASL signs are written in capitals. 'Deaf' is used to refer to individuals and groups who regard themselves as culturally Deaf; 'deaf' refers to the audiological status of individuals.
3. Note that Liddell and Johnson's (1989) transcription of the sign is MHMMH as opposed to HMH. The issue, however, is the same. Liddell and Johnson do not consider the contact cheek form.

4. Olathe is in Kansas, near Kansas City, and is the site of the Kansas School for the Deaf. The white signers from this region all resided in Olathe. The African American signers resided in Kansas City, Missouri.
5. Contact signing is the natural outcome of the contact between ASL and English. It is a third system that combines features of both languages. Contact signing is characterized by signs in English word order produced with continuous silent mouthing, by the use of English prepositions and embedding devices, and by the use of space and some non-manual signals (facial expressions) native to ASL. In the early 1970s, this kind of signing was labeled Pidgin Sign English (Woodward and Markowicz 1975), but examination of both its linguistic and sociolinguistic features revealed that it does not fit the criteria commonly accepted for pidgins (Lucas and Valli 1992). Contact signing is distinct from the different systems that have been invented, usually for educational purposes, to represent English on the hands, known collectively as Manually Coded English (MCE). MCEs are characterized by signs in English word order produced simultaneously with spoken English and with no ASL non-manual markers or use of space.
6. In addition to the variable discussed in this article, we are also examining '1'-handshape variation, location variation, as represented by signs such as KNOW, and alternation between null and overt subjects.
7. It may be argued that DEAF as used in compounds such as DEAF[^]WORLD and DEAF[^]CULTURE is also an adjective. However, terms such as DEAF[^]WORLD, which are particularly salient in the Deaf community, have come to be regarded by ASL natives as single lexical items, such as English 'breakfast.'
8. In VARBRUL analysis, the application value is the value of the dependent variable that results when a rule applies. In -t/d deletion in English, for example, the application value is usually defined as absence of final -t/d.
9. The relationships among Deaf settlement patterns, Deaf residential schools, the status of ASL, and patterns of variation will be explored more fully in a volume on the project of which the current article forms a part. The volume will report on three phonological variables, null subject variation, and lexical variation (Lucas, Valli, Schatz, Rose, Bayley, Wulf and Dudis forthcoming).
10. If our account of the derivation of the contact-cheek variant of DEAF (metathesis followed by deletion) is correct, exclusion of contact-cheek tokens is not justified. We do so here only for the purpose of comparing the results of empirical study with Liddell and Johnson's (1989) claim. When the contact cheek variant is excluded, the results for the grammatical category factor group are: noun .521; adjective .554; predicate adjective .404; compound .492. Discourse genre and ageXregion are also significant. The change in the value for compounds, from .660 with contact-cheek tokens included to .492 with contact-cheek tokens excluded, is not surprising since contact-cheek is the most common variant of DEAF in compounds. When contact-cheek tokens are removed from the analysis the proportion of +cf to -cf forms for compounds is very close to the proportion for nouns and adjectives.
11. There is some question as to whether HOME permits metathesis. Liddell and Johnson (1989) claim that it does, whereas there is disagreement among Deaf informants as to whether it does or not.

REFERENCES

- Aramburo, Anthony. 1989. Sociolinguistic aspects of the Black Deaf community. In Ceil Lucas (ed.) *The Sociolinguistics of the Deaf Community*. San Diego, California: Academic Press. 103–119.
- Battison, Robbin M., Harry Markowicz and James C. Woodward. 1975. A good rule of thumb: Variable phonology in American Sign Language. In Ralph W. Fasold and Roger Shuy (eds.) *Analyzing Variation in Language*. Washington, D.C.: Georgetown University Press. 291–302.
- Baynton, Douglas C. 1996. *Forbidden Signs: American Culture and the Campaign Against Sign Language*. Chicago: University of Chicago Press.
- Coulter, Geoff. (ed.). 1992. *Phonetics and Phonology, Vol. 3: Current Issues in ASL Phonology*. San Diego, California: Academic Press.
- Frishberg, Nancy. 1975. Arbitrariness and iconicity: Historical change in American Sign Language. *Language* 51: 696–719.
- Guy, Gregory R. 1988. Advanced VARBRUL analysis. In Kathleen Ferrara, Becky Brown, Keith Walters and John Baugh (eds.) *Linguistic Contact and Change: Proceedings of the Sixteenth Annual Conference on New Ways of Analyzing Variation*. Austin: University of Texas Department of Linguistics. 124–136.
- Guy, Gregory R. 1997. Violable is variable: Optimality theory and linguistic variation. *Language Variation and Change* 9: 333–347.
- Guy, Gregory R. and Robert Bayley. 1995. On the choice of relative pronouns in English. *American Speech* 70: 148–162.
- Henry, Alison. 1995. *Belfast English and Standard English: Dialect Variation and Parameter Setting*. New York and Oxford: Oxford University Press.
- Kroch, Anthony. 1978. Toward a theory of social dialect variation. *Language in Society* 7: 17–36.
- Labov, William. 1966. *The Social Stratification of English in New York City*. Washington, D.C.: Center for Applied Linguistics.
- Labov, William. 1969. Contraction, deletion, and inherent variability of the English copula. *Language* 45: 715–762.
- Labov, William. 1972. The transformation of experience in narrative syntax. *Language in the Inner City: Studies in the Black English Vernacular*. Philadelphia: University of Pennsylvania Press. 354–397.
- Labov, William. 1984. Field methods of the Project on Language Change and Variation. In John Baugh and Joel Sherzer (eds.) *Language in Use: Readings in Sociolinguistics*. Englewood Cliffs, New Jersey: Prentice-Hall. 28–53.
- Labov, William. 1989. The child as linguistic historian. *Language Variation and Change* 1: 85–97.
- Lane, Harlan, Robert Hoffmeister and Ben Bahan. 1996. *Journey into the DEAF-WORLD*. San Diego, California: DawnSign Press.
- Liddell, Scott K. 1992. Holds and positions: Comparing two models of segmentation in ASL. In Geoff Coulter (ed.) *Phonetics and Phonology, Vol. 3: Current Issues in ASL Phonology*. San Diego, California: Academic Press. 189–211.
- Liddell, Scott K. and Robert E. Johnson. 1989. American Sign Language: The phonological base. *Sign Language Studies* 64: 195–278.
- Long, J. Schuyler. 1910. *The Sign Language: A Manual of Signs*. Des Moines, Iowa: Robert Henderson.
- Lucas, Ceil. 1995. Sociolinguistic variation in ASL: The case of DEAF. In Ceil Lucas (ed.)

- Sociolinguistics in Deaf Communities*, Vol. 1. Washington, D.C.: Gallaudet University Press. 3–25.
- Lucas, Ceil and Clayton Valli. 1992. *Language Contact in the American Deaf Community*. San Diego, California: Academic Press.
- Lucas, Ceil, Clayton Valli, Susan Schatz, Mary Rose, Robert Bayley, Alyssa Wulf and Paul Dudis. Forthcoming. *Sociolinguistic Variation in ASL (Sociolinguistics in Deaf Communities, Vol. 7)*. Washington, D.C.: Gallaudet University Press.
- Milroy, Leslie. 1987. *Observing and Analyzing Natural Language*. Oxford: Blackwell.
- Nagy, Naomi and Bill Reynolds. 1997. Optimality theory and variable word-final deletion in Faetar. *Language Variation and Change* 9: 37–56.
- Oviedo, Alejandro. 1996. Bilingual Deaf education in Venezuela: Linguistic comments on the current situation. In Ceil Lucas (ed.) *Multicultural Aspects of Sociolinguistics in Deaf Communities (Sociolinguistics in Deaf Communities, Vol. 2)*. Washington, D.C.: Gallaudet University Press. 61–79.
- Padden, Carol. 1998. From the cultural to the bicultural: The modern Deaf community. In Ila Parasnisi (ed.) *Cultural and Language Diversity and the Deaf Experience*. Cambridge: Cambridge University Press. 79–98.
- Padden, Carol and Tom Humphries. 1988. *Deaf in America: Voices from a Culture*. Cambridge, Massachusetts: Harvard University Press.
- Patrick, Peter and Melanie Metzger. 1996. Sociolinguistic factors in sign language research. In Jennifer Arnold, Renée Blake, Brad Davidson, Scott Schwenter and Julie Solomon (eds.) *Sociolinguistic Variation: Data, Theory, and Analysis. Selected papers from NWAV 23 at Stanford*. Stanford, California: Center for the Study of Language and Information. 229–240.
- Perlmutter, David. 1992. Sonority and syllable structure in American Sign Language. In Geoff Coulter (ed.) *Phonetics and Phonology, Vol. 3: Current Issues in ASL Phonology*. San Diego, California: Academic Press. 227–261.
- Ramsey, Claire L. 1997. *Deaf Children in Public Schools: Placement, Context, and Consequences (Sociolinguistics in Deaf Communities, Vol. 3)*. Washington, D.C.: Gallaudet University Press.
- Rand, David and David Sankoff. 1990. *GoldVarb: A Variable Rule Application for the Macintosh* (version 2.0) [computer program]. Montreal: Centre de recherches mathématiques, Université de Montréal.
- Rousseau, Pascale and David Sankoff. 1978. Advances in variable rule methodology. In David Sankoff (ed.) *Linguistic Variation: Models and Methods*. New York: Academic Press. 57–69.
- Sandler, Wendy. 1992. Linearization of phonological tiers in ASL. In Geoff Coulter (ed.) *Phonetics and Phonology, Vol. 3: Current Issues in ASL Phonology*. San Diego, California: Academic Press. 103–129.
- Sankoff, David. 1988. Variable rules. In Ulrich Ammon, Norbert Dittmar and Klaus J. Mattheier (eds.) *Sociolinguistics: An International Handbook of the Science of Language and Society*, Vol. 2. Berlin: de Gruyter. 984–997.
- Sankoff, David and Pascale Rousseau. 1989. Statistical evidence for rule-ordering. *Language Variation and Change* 1: 1–18.
- Schein, Jerome D. 1987. The demography of deafness. In Paul C. Higgins and Jeffrey E. Nash (eds.) *Understanding Deafness Socially*. Springfield, Illinois: Thomas. 3–28.
- Schein, Jerome D. and Marcus T. Delk. 1974. *The Deaf Population of the United States*. Silver Spring, Maryland: National Association for the Deaf.
- Sicard, Roch-Ambroise. 1808. *Théorie des signes pour servir d'introduction à l'étude des langues*, Vol. 1. Paris: Roret et Mongie.

- Stokoe, William C. 1960. *Sign Language Structure: An Outline of Visual Communication Systems of the American Deaf* (Studies in Linguistics: Occasional Paper 8). Buffalo, New York: University of Buffalo.
- Stokoe, William C., Dorothy C. Casterline and Carl G. Croneberg. 1965. *A Dictionary of American Sign Language on Linguistic Principles*. Silver Spring, Maryland: Linstock Press..
- Uyechi, Linda. 1994. *The Geometry of Visual Phonology*. Unpublished Ph.D. dissertation. Stanford, California: Stanford University.
- Van Manen, James W. 1997. DEAF: A journey through the film history of a sign. Unpublished paper. Washington, D.C.: Gallaudet University.
- Woodward, James C. 1973a. Implicational Lects on the Deaf Diglossic Continuum. Unpublished Ph.D. dissertation. Washington, D.C.: Georgetown University.
- Woodward, James C. 1973b. Interrule implication in American Sign Language. *Sign Language Studies* 3: 47–56.
- Woodward, James C. 1976. Black southern signing. *Language in Society* 5: 211–218.
- Woodward, James C. and Harry Markowicz. 1975. Some handy new ideas of pidgins and creoles: Pidgin sign languages. Paper presented at the Conference on Pidgin and Creole Languages, Honolulu, Hawaii.
- Young, Richard and Robert Bayley. 1996. VARBRUL analysis for second language acquisition research. In Robert Bayley and Dennis R. Preston (eds.) *Second Language Acquisition and Linguistic Variation*. Amsterdam and Philadelphia: John Benjamins. 253–306.
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