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Variations in the Baghcheban Manual Alphabet in Iranian Sign Language

Abstract

In 1924 Jabbar Baghcheban created a manual system that employed the phonetic characteristics of spoken Persian and Perso-Arabic orthography for use in the education of deaf students (Ibrahimi 2007). This article is a first exploration of variation and change in this system as it has evolved into the Iranian manual alphabet. Data on the articulation of individual letter forms were collected from forty-five deaf signers representing all thirty-one provinces of Iran. The three principle findings are as follows: First, regional variation occurs in the production of the Baghcheban manual alphabet (BMA); second, the marking of phonetic distinctions has declined, whereas the marking of orthographic distinctions has expanded; third, the trend toward making similar letters more dissimilar (in order to facilitate production) is increasing. Information on changes in this system will help meet the growing interest in learning Iranian Sign Language, Zaban Eshare Irani (ZEI), among hearing and deaf people. Moreover, the documenting of variations will likely enhance communication among deaf individuals in different regions. Research on communication in the Iranian Deaf community will also help raise the status of the community and improve deaf people's education.

The term "manual alphabet" most commonly refers to systems that are representations of orthography used to articulate (fingerspell) the written forms of spoken languages (Sutton-Spence and Woll 2013). Although fingerspelling is distinct from signing, it serves a range of functions for signers. For instance, it is both a means of representing

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words that have no sign equivalents (e.g., place names, proper names) and a means of borrowing into sign language. Schembri and Johnston (2007) believe that a complex relationship exists between fingerspelling and signs .They note additional reasons for fingerspelling: lack of knowledge of a certain sign; absence of a certain sign in the interlocutors' active vocabulary; emphasis (when an equivalent sign exists; see Sutton-Spence and Woll 2013),clarification of a specific meaning; uncertainty about whether the addressee knows a particular sign; demonstration of knowledge of English; and sometimes just a preference for fingerspelling in a certain context. Sutton-Spence and Woll (2013) add fingerspelling in pedagogical situations to indicate English morphology, which differs from that of British Sign Language (BSL) (e.g., i-s or i-n-g).

Fingerspelling is considered to be the third mode of communication based on a writing system (as a second mode), which is in turn based on spoken language as the first mode (Sutton-Spence 1994). This might explain why it is difficult to find a similar issue in spoken language that clarifies the connection between sign language and fingerspelling (Sutton-Spence and Woll 1993). In fact, the relationship between sign language and spoken/written language in the deaf and hearing communities has resulted in just such a tertiary channel of communication (Lucas and Valli 1992). "Tertiary," in this context, refers to contact signing, under which fingerspelling may be subsumed (ibid.).Both two-handed and one-handed manual alphabets exist for a number of orthographies.

In addition to manual alphabets, which represent orthography, other systems use hand configurations and locations to provide information about the articulation and phonetic characteristics of speech. As in a number of other such systems, BMA was originally invented to represent the sounds of speech (e.g., Duarte 2010); BMA was intended for use in teaching deaf people how to use their speech organs (articulatory system) to produce specific sounds.Then, for each sound, a handshape was created to represent the corresponding Persian alphabet letters. Although Baghcheban's main intention was to teach the sounds of the Persian alphabet to deaf people, he created nine handshapes (not based on sounds) for nine letters(e.g., s̲, z̲, ṣ, ẕ, ṭ, ẓ, ʿ, ġ, h) that were phonetically similar to six other letters (e.g., s̲ and ṣ=s;

ṭ=t; ẕ, ẓ, and ẓ=z; ʿ=ʾ; ġ=q; h=ḥ) but were different in shape in order to represent all of the letters of the Persian alphabet. This article discusses whether BMA remains a representation of speech or whether it has become a type of manual alphabet; I also consider the nine handshapes to determine whether they have undergone any important changes (even though were basically manual, not phonetic, creations). The latter finding would help prove whether or not the changes are systematically moving toward manualism.

SociolinguisticVariations in Manual Alphabets

The effect of sociolinguistic variables (e.g., gender, age, region, social class, family background, education) on fingerspelling has been studied by several researchers. One such study (Sutton-Spence, Woll, and Allsop1990) looked at both the influence of age, gender, region, and communication mode on the use of English fingerspelling (translation of English words) and the influence of BSL loan fingerspelling (complete lexicalization as a part of BSL). The researchers (ibid.) collected data from deaf signers and from interviews by the hosts of a BBC show; both synchronic and diachronic analyses were performed. The results did not indicate any significant difference between males and females. However, differences existed in the use of these two types of fingerspelling throughout the country and among older and younger people (Kelly 1991 confirmed these results). The older signers' extensive use of fingerspelling was attributed to the education of deaf communities through fingerspelling in the early twentieth century, which aimed to teach them written English, while the younger generation experienced more awareness of deaf people's rights and sign language. An important finding of the study by Sutton-Spence, Woll, and Allsop 1990 is the reduction of the hosts' fingerspelling as the use of sign-with-voice decreased; this decline may also be interpreted based on the decrease in the use of sign-with-voice on television and increasing the awareness of Deaf community's rights and language being reflected in the presence of the signing hosts. The authors (Sutton-Spence, Woll, and Allsop 1990) found that the extent of BSL fingerspelling was not affected by any social variables, which indicates that it differs from English fingerspelling and resembles signs.

Concerning the mode of communication, in the 1980s it was found that, over time, deaf individuals use more sign-only and less sign-with-voice (Allsop, Woll, and Spence 1990). Another study indicated that the users of the latter mode used more English fingerspelling; however, over time they used more sign-only and less English fingerspelling (Woll and Allsop 1990).

Another study found significance differences between old and young native Auslan signers, with the former using more fingerspelling (Schembri and Johnston 2007); small variations were observed throughout Australia. For instance, topic is of importance (e.g., talking about one's family called for the repeated use of the signs for "father" and "mother," which are fingerspelled in Auslan). The authors cautiously reported the distribution of fingerspelled grammatical categories, which was similar to that in ASL and BSL, in which nouns are fingerspelled much more often than verbs.

Another work explains the influence of social variables (e.g., age, gender, family, education, religion, ethnic group, region, situation [formality vs. informality], contact language) on sign languages (Woll and Sutton-Spence 2005; see also Sutton-Spence and Woll 2013). Compared to the existing research on spoken languages, our study of various aspects of sign languages, including social factors, is still in its infancy, according to these authors. They believe that fingerspelling has gradually declined, and thus the younger generation of signers uses it less often than older signers do. These researchers also examined the effect of geographical region on fingerspelling and found that signers in the south of England fingerspell less frequently than do those in northern England and Scotland.

The studies on manual alphabets and fingerspelling have examined the phonetics of ASL (e.g., Brentari 1998), the variation of fingerspelling between males and females (Mulrooney 2002), the understanding of fingerspelling when the letters are not completely produced or eliminated (e.g., Hanson 1981), and acquisition of fingerspelling by deaf children (e.g., Padden 1991; Blumenthal-Kelly 1995).

The purpose of the current study was to look for variations in the articulation of individual letters of BMA in different provinces and cities of Iran. Variations in the articulation of individual letters show

that characteristics such as ease of articulation and discriminability are relevant to all languages (spoken as well as signed).

Iranian Manual Alphabets

As mentioned earlier, the manual alphabet used in Iran was developed in 1924 by Jabbar Baghcheban (1885–1966). The history of Iranian deaf people reveals other attempts to create a manual alphabet as well. Unfortunately, no book, article, or other document describes their efforts; we have only oral reports of them. The only resource found today is Rouzbeh Ghahreman's website, which briefly recounts those efforts.[1] Zabih Behrouz, Julia Ann Oliver Samii, and Ruzik Shahbazian also invented a specific system for an Iranian manual alphabet (Ghahreman,translated by Ghari 2015).

Zabih Behrouz (1890–1971) believed that an alphabet is key to development and that children's problems with literacy result from the arbitrariness of such systems (i.e., the dissimilarity between the configuration of a letter or a sound and the shape of the mouth means that the letters do not appear to be logical). Thus Behrouz invented a system of writing—the New Method Alphabet for the Persian Writing System—which utilized the articulatory system. The cross-sectional shape of a particular organ of speech during pronunciation was drawn and considered to indicate a certain letter. Behrouz was familiar with the theory of "visible speech," proposed by Alexander Graham Bell's father, Alexander Melville Bell, and may have been influenced by Bell'sidea. Generally Zabih was interested in such theories, whereas Baghcheban dealt more with the practical aspect of education. Behrouz's alphabet found little favor. It is believed that Zabih and Baghcheban influenced one another (Nuri2009).

In 1975 Julia Samii introduced a manual alphabet that differed from Baghcheban's by not using the face and lips (see figure 1).[2] However, three years later, in 1978, she was killed in an airplane clash, and so her alphabet was put aside.

In 1994, Mahmouz Pakzad, director of the Deaf Society of Iran, suggested that another system manual alphabet be developed. Therefore, a committee consisting of Rouzik Shahbazian (senior assistant to the executive director), Mahdi Mahbaz, and Habib Mahdavi Noshahr

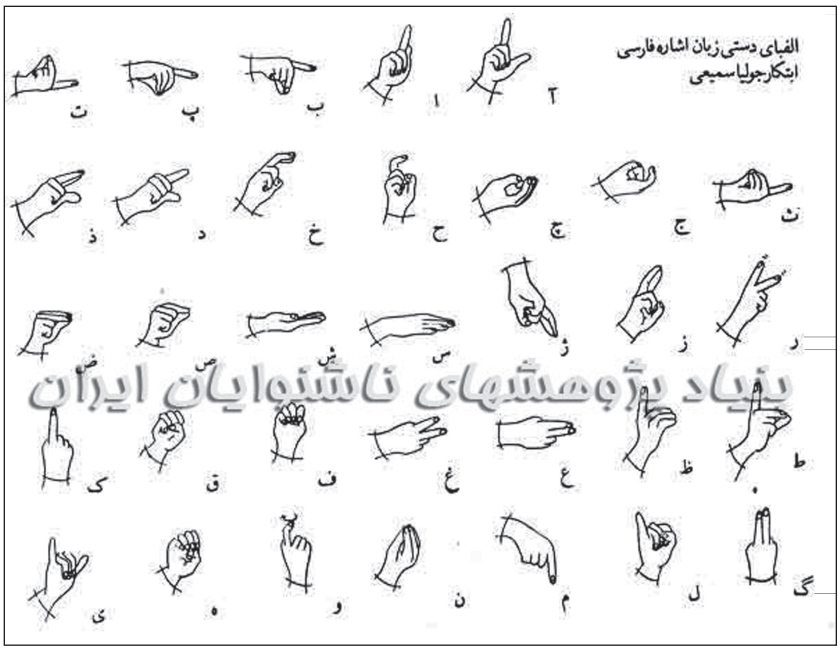


Figure 1. Julia Samii's manual alphabet of Persian.

(the latter two were educated deaf individuals) was formed. A manual alphabet comprising thirty-eight letters and called the Rouzik Shahbazian manual alphabet was created (see figure 2). Seventeen of its letters were copied from the American manual alphabet although the shapes of the Persian letters are very different from the English ones. Deaf people have a tendency to favor a written form of their language, and they prefer to have the manual alphabet match the written shapes of the letters. Thus, the alphabet, which did not resemble the configurations of the Persian letters, was unsuccessful.

In 1996, due to the failure of Rouzik Shahbazian's alphabet, the Research and Development Committee of ZEI, which included Mohsen Mousavi, Morteza Pirouzi, Habib Tehrani, Reza Mahmoudi, and Iran Bahadori (educated deaf individuals at that time) decided to revive Julia Samii's manual alphabet after a lapse of twenty years. After slightly changing only four letters (*ف* /f/, *ش* /ʃ/, *ژ* /ʒ/, *ء* /æ/) (see table 1) to make them more efficient and convenient, they developed

FIGURE 2. Rouzik's manual alphabet.

Table 1. Persian Alphabet

	Name	Name in Persian Script	DIN 31635	IPA	Contextual Forms		
					Final	Medial	Initial
0	hamza[3]	همزه	ʾ	[ʔ]	ـئ ـأ ـؤ	ـئـ	ئـ
1	ʾalef	فـلـا	ā	[ɒ]		ـا	ا / آ
2	be	بِ	b	[b]	ـب	ـبـ	بـ
3	pe	پِ	p	[p]	ـپ	ـپـ	پـ
4	te	تِ	t	[t]	ـت	ـتـ	تـ
5	s̱e	ثِ	s̱	[s]	ـث	ـثـ	ثـ
6	jim	جیم	j	[d͡ʒ]	ـج	ـجـ	جـ
7	če	چِ	č	[t͡ʃ]	ـچ	ـچـ	چـ
8	ḥe(-ye jimi)	حِ	ḥ	[h]	ـح	ـحـ	حـ
9	khe	خِ	x	[x]	ـخ	ـخـ	خـ
10	dāl	دال	d	[d]	ـد	ـد	د
11	ẕāl	ذال	ẕ	[z]		ـذ	ذ
12	re	رِ	r	[ɾ]		ـر	ر
13	ze	زِ	z	[z]		ـز	ز
14	že	ژِ	ž	[ʒ]		ـژ	ژ
15	sin	سین	s	[s]	ـس	ـسـ	سـ
16	šin	شین	š	[ʃ]	ـش	ـشـ	شـ
17	ṣād	صاد	ṣ	[s]	ـص	ـصـ	صـ
18	ẓād	ضاد	ẓ	[z]	ـض	ـضـ	ضـ
19	ṭā, ṭoy (in Dari)	طا, طی	ṭ	[t]	ـط	ـطـ	طـ
20	ẓā, ẓoy (in Dari)	ظا, ظی	ẓ	[z]	ـظ	ـظـ	ظـ
21	ʿeyn	عین	ʿ	[ʔ]	ـع	ـعـ	عـ
22	ġeyn	غین	ġ	[ɣ] / [ɢ]	ـغ	ـغـ	غـ
23	fe	فِ	f	[f]	ـف	ـفـ	فـ
24	qāf	قاف	q	[ɢ] / [ɣ] / [q] (in some dialects)	ـق	ـقـ	قـ
25	kāf	کاف	k	[k]	ـک	ـکـ	کـ
26	gāf	گاف	g	[g]	ـگ	ـگـ	گـ
27	lām	لام	l	[l]	ـل	ـلـ	لـ
28	mim	میم	m	[m]	ـم	ـمـ	مـ
29	nun	نون	n	[n]	ـن	ـنـ	نـ
30	he(-ye do-češm)	هِ	h	[h]	ـه	ـهـ	هـ
31	vāv	واو	v / ū / ow / (w / aw/ ō in Dari)	[v] / [uː] / [o] / [ow] / ([w] /[aw] / [oː] in Dari)	ـو	و	ـيـ
32	ye	یِ	y / ī / á / (ay / ē in Dari)	[j] / [i] / [ɒː] / ([aj] / [eː] in Dari)	ـی	ـيـ	يـ

Source: https://en.wikipedia.org/wiki/Persian_alphabet .

Source: www.idsf.ir/maghalat/169/----166/318-history-sign-language-persian.html.

FIGURE 3. Mohsen Mousavi's adapted alphabet.

the third Iranian manual alphabet, which had thirty-seven letters. This system is often called the Mohsen Mousavi manual alphabet due to his extensive efforts to bring it about.

The Mohsen Mousavi manual alphabet is generally used for the names of months and some colors; only the initial letter of each name or initialization is used (figure 3). Carmel (1982) presents this alphabet system in his International Hand Alphabet Charts, with slight differences for vowels, *f* and *n* (39).

At the moment, it is the Baghcheban manual alphabet (figure 4) that is used extensively in all of the provinces and cities of Iran, in schools, or in Deaf communities. This system is based on phones, not letters, so it is viewed as a phonetic alphabet. Some people consider it a kind of Cued Speech, which I explain later.

In fact, lipreading and speech form the basis of the Baghcheban alphabet:

> The variety of sounds in spoken language is due to different positions of the speech organs in articulating sounds . . . therefore, the teachers who want to help deaf students talk should draw their attention to the movements of their [teachers'] own speech organ[,] making the students copy the positions of the speech organs in articulating sounds. Consequently, the more similar the shapes/movements of the students' speech organ[s]are to that [*sic*] of their teachers, the better they talk. (Baghcheban 1964, 7)[3]

Baghcheban divided the Persian sounds into two groups (which he subdivided into fricatives and nonfricatives) of laryngeal and vocalic sounds (Pakzad 2009):

1. ʾ *a* /æ/, *e* /e/, *o* /o /, *ā* /ɒ/, *u* /u:/, *I* /I:/ (fricative)
2. *r* /r/, *ž* /z/, *ǯ* /ʒ, ʿ/ʔ/, *l* /l/, *m* /m/, *n* /n/, *v* /v/, *γ* /y/ (fricative)

and pharyngeal sounds:

3. *x* /x/, *s* /s/, *š* /ʃ/, *f* f/, *h* /h/ (fricative)
4. *p* /p/, *t* /t/, *Č*/t͡ʃ/, *k* /k/ (nonfricative)

Baghcheban classifies five others sounds as ambiguous. These are pronounced essentially by accompanying them with a vowel:

5. *b* /b/, *j* /j/, *d* /d/, *g* /g/, *q* /ɣ/, /ɢ/, or /q/ (fricative)

To help deaf children speak, Baghcheban tried to find and classify sounds on the basis of similar places of articulation. He used the senses of sight and touch to make the sounds more transparent to his deaf students. The culmination of his work was his unique manual alphabet. Manual alphabets usually employ a variety of handshapes that somewhat resemble the letters of a written alphabet. However, Baghcheban's alphabet was developed not only by creating a variety

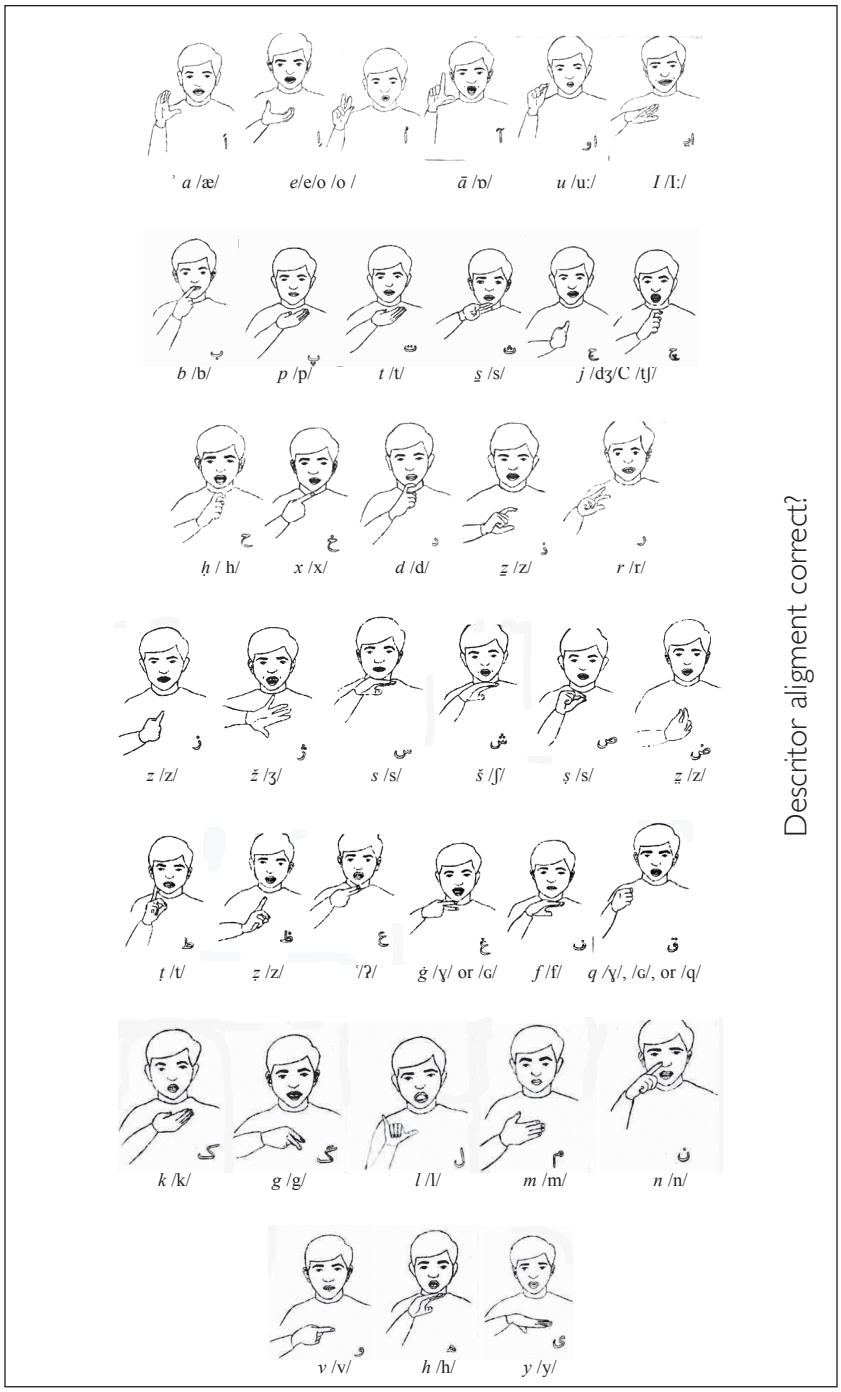


FIGURE 4. Baghcheban'smanual alphabet.

of handshapes but also by placing the hand near or on the parts of the articulatory system. As discussed earlier, only nine handshapes (s̲, z̲, ṣ, ẓ, ṭ, ẕ, ʿ, ġ, h) were created manually and were not based on sounds because they were similar to the sounds of six other letters (s̲ and ṣ= s; ṭ=t; z̲, ẓ, and ẕ=z; ʿ=ʾ; ġ=q; h=ḥ) but different in shape.

Baghcheban endeavored to cover all of the letters of the Persian alphabet. For instance, he explained that for the pronunciation of the laryngeal sounds (1 and 2), the teacher should put the student's hand on the teacher's chest and draw the student's attention to the teacher's lips or other place of articulation while continuously pronouncing the sound.

Teaching the pronunciation of ġ /ɣ/ or /ɢ/ is different, however. Specifically, the teacher should put one of the student's hands on the teacher's chest and the other hand on the teacher's throat. Alternatively, the teacher can sit in such a way that the student can see the teacher's throat. Then, the teacher should put a little water in his or her own mouth, while keeping the student's hand on the teacher's chest, and then move or swirl the water in his or her mouth with the pronunciation of /ɣ/ or /ɢ/. Then, the teacher should ask the student to do the same. Baghcheban explains that, by applying pressure on the throat, the student prevents the water from going to the stomach; thus the student learns about the pressure needed to pronounce the sound/ɣ/ or /ɢ/. The reason for putting the student's hand on the teacher's chest is that it enables the student to understand that the movement of water in the mouth and throat happens simply by producing the sound; otherwise, instead of pronouncing /ɣ/ or /ɢ/, the student will pronounce /x/. The sound of /x/ can be taught in the same manner; however, the teacher should ensure that the student moves the water in the mouth by breathing out, not by producing a laryngeal sound; otherwise, the pronunciation will sound like /ɣ/ or /ɢ/.

However, for the pronunciation of the pharyngeal fricative sounds, according to Baghcheban, the teacher needs to draw the student's attention to the teacher's lips, then hold the back of the student's hand near the teacher's lips while pronouncing the sound and breathing out vigorously so that the student can feel the exhalation. In order to teach the pronunciation of pharyngeal nonfricative sounds, the teacher should put pea-sized pieces of cotton in his or her own hand,

keep the hand near his or her lips, and toss the pieces away while pronouncing the sounds.

To teach the ambiguous sounds, Baghcheban suggests that the teacher put the back of the student's hand near the teacher's mouth and draw the student's attention to the mouth, showing the place of articulation; these sounds should precede or follow a vowel (e.g., /ba:/) because they have no sound by themselves. Then, while continuously and strongly pronouncing the sound, the teacher should breathe out so that the student's hand can feel the exhalation. This helps the student realize that, with the proper pronunciation, the outbreath can be felt. The teacher can ask the student to practice the pronunciations in front of a mirror to ensure the correct shape of the mouth or other place of articulation. The place of articulation, according to Baghcheban, for *b* is the lips; for *j,* the upper teeth are placed on the lower teeth; for *d,* the tip of the tongue is placed behind the lower teeth; for *g,* the middle part of the tongue reaches up and touches the palate; and for ġ, the back part of the tongue pushes (the exact word Baghcheban uses) the back of the throat.

To teach and remind students of each letter's place of articulation, Baghcheban created a system of manual signs and encouraged teachers to use them correctly. He distinguished his signs from the manual alphabet for ASL by saying that the ASL alphabet is for deaf people who do not wish to learn to speak; however, his own signs help deaf students to talk correctly and clearly. He suggests that teachers also use the manual signs for dictation practice before the students learn to lipread.

This system is not without problems; because it was created mainly for correct pronunciation and speech, not communication, the similarities of producing the various groups of letters—*p* /p/, *t* /t/, *k*/k/; s /s/, *š* /ʃ/*f* /f/; *z* /z/, *j* /d͡ʒ/, *v* /v/; *Č* /t͡ʃ/ and ḥ /h/; ʿ/ʔ/ and ġ /ɣ/ or /ɢ/—make them difficult to distinguish, particularly when the signer is not very close to the audience and/or is signing to a large group because the mouth shapes cannot be easily noticed and differentiated in such situations. However, the extensive use of this manual alphabet by deaf people in Iran caused me to wonder whether it has been adapted to deaf people's needs. I hypothesize that, regardless of a system's origin, once it comes into use, it is subject to the requirements

for efficiency in communication; that is, it will likely undergo changes. If it does so, it would then be a great contribution to the teaching of BMA, interpreting, facilitating communication (both production and perception of letters and consequently the entire context), and improving our understanding of human language as a whole.

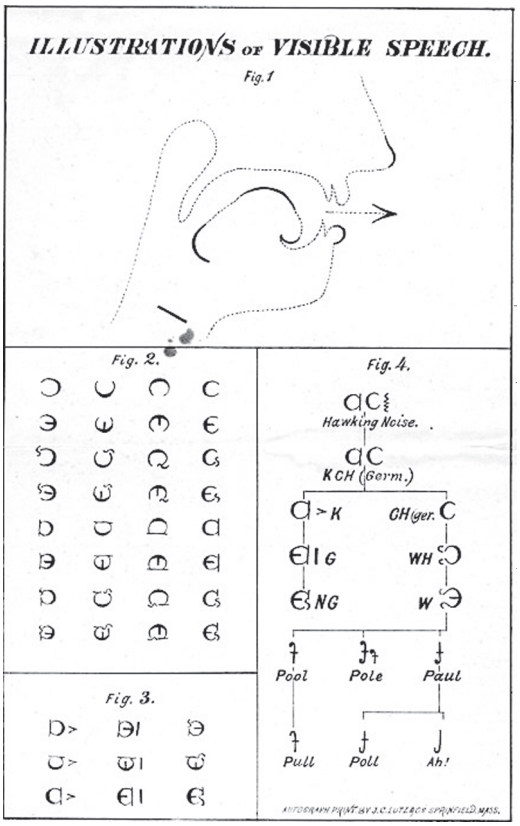
Visible Speech

As I mentioned earlier, Zabih Behrouz is believed to have been influenced by Alexander Melville Bell's visible speech system, which was developed in 1867. The system consists of phonetic symbols that represent the position of the speech organs in producing the sounds of a language; it indicates the positions and movements of the lips, tongue, and throat. The system was originally invented to help deaf people to learn and improve their speech by teaching them how to use their vocal cords in order to produce specific sounds even though they had never heard those sounds. The system comprises fifty-two consonants, thirty-six vowels, and a vast number of diphthongs (he presents seventy-two in the book), a number of tones, and twelve glides (see figure 5). This system eventually failed because it was cumbersome (Bell 1867).

Visible speech was originally created for various purposes, including teaching people to read within the same short period of time needed to learn the common English letters (Bell1899). The lessons that were based on this system were of significant value in teaching the spoken language to deaf, blind, and illiterate people all over the world. It helped them learn to read both in their native language and in foreign languages. Bell pointed out that the system was, in fact, meant to help with the pronunciation of letters, not to replace them. However, for international purposes he suggested that his system displace the local alphabets.

Cued Speech

Cued Speech is a system that was first created by R. Orin Cornett in 1967 and was later adapted for use in almost sixty languages and dialects; it consists of eight handshapes, called cues. As representations of consonants, these are placed on four locations around the mouth to indicate vowels (Leybaert and Alegria 1990). The handshapes and



Source: https://en.wikipedia.org/wiki/Visible_Speech.

FIGURE 5. Visible speech.

placements, along with the mouth movements and speech, enable users to differentiate between the sounds. That is, many speech sounds look the same on the lips; the handshapes help users to distinguish one sound from another. The purpose of this system is to make speech and sounds visible or accessible to deaf individuals. This in turn develops their language skills. Studies of the impact of Cued Speech have revealed improvement in speech, speech-reading, deaf people's ability to make discriminations in speech, and literacy (which was considered the main aim of Cued Speech (Movallali and Abdollahzadeh Rafi 2012; Movallali 2009). These researchers believe that, by using Cued Speech, deaf people can benefit from any residual hearing they might have.

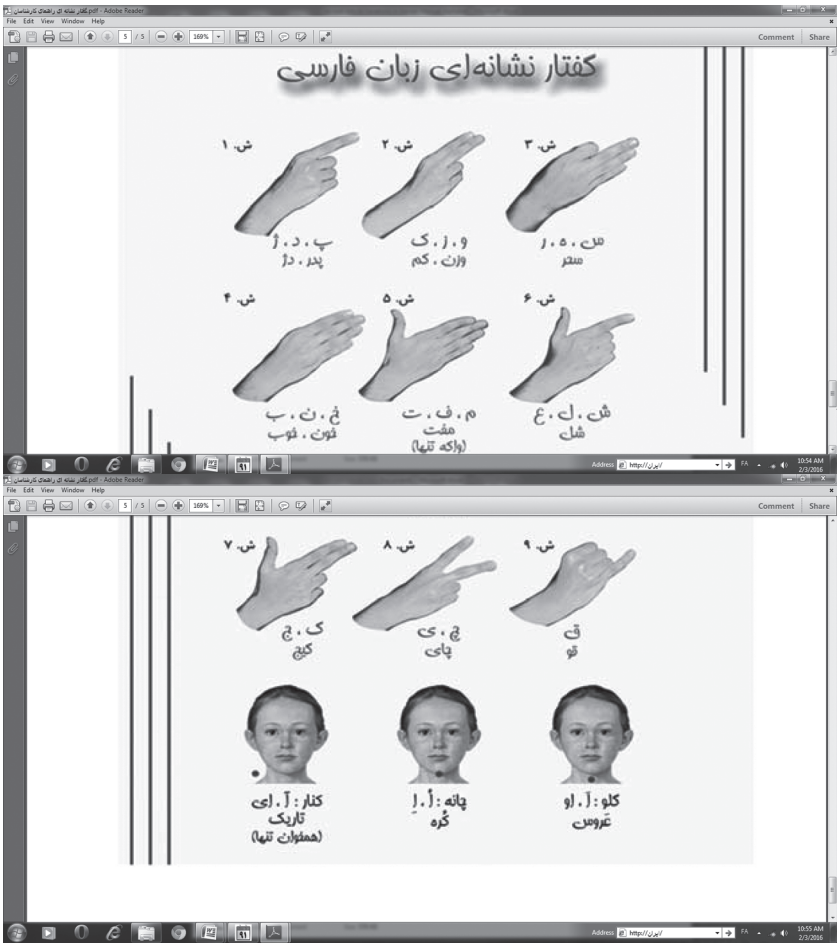


Figure 6. Farsi Cued Speech.

Cued Speech is based on sounds or phonemes rather than on an alphabet (LaSasso, Crain, and Leybaert 2010). It was adapted and used in different languages and for a variety of learning needs in many places, including Iran. In 2009 Movallali created Farsi Cued Speech as a project for her doctoral dissertation (see figure 6). Farsi Cued Speech consists of nine handshapes that represent consonants: Each group of phonemes has a different handshape and mouth movement. The handshapes are placed near the face in any of three different positions. Each position indicates a separate group of vowels (Movallali 2009).

With regard to the role of Cued Speech in reading, while hearing people are developing oral language, the phonological representations are internalized in their mind. This helps them to understand, produce, and think about speech (Leybaert and Alegria 1990). The phonological representations that are stored in the lexicon are used for the short-term retention of spoken or written words (Conrad 1962, 1963). These can be activated after the printed words are recognized because the phonological, semantic, and orthographic features of a word are stored together. Because the phonological representations can be divided into morphemes that match the letters of the alphabet, hearing individuals learn graphophonological rules. Applying these rules when encountering printed words, they can conjoin the phonological representations and thus have access to the lexicon, just as they have access to spoken words (Leybaert and Alegria 1990). Residual hearing, articulatory feedback, and lipreading (labial cues) play the same role for deaf people as phonology or auditory input does for hearing people (ibid.). Therefore, deaf persons can understand phonological rules and the letter patterns that give them access to the lexicon.

Although some people classify BMA as a subbranch of Cued Speech, it does not exactly match the definition given in books on the linguistics of sign languages (e.g., Sutton-Spence and Woll 2013, 36): "Hand cues are made near the mouth, to identify the different sound speech sounds which look the same on the lips (e.g.[,] /p/, /b/, and /m/) or those which cannot be seen on the lips at all (e.g.[,] /k/ and /g/)." Cued Speech does not use signs, and the cues convey no meaning by themselves. This system relies on sounds and is not a complete system to be used for communication; it is simply a means of learning English. Only eight handshapes (used as a group of consonants in English) and different lip patterns show all of the sounds. However, BMA makes use of thirty-eight one-handed letters (thirty-two consonants and six vowels) that employ fifteen different handshapes (see figure 4); the handshapes are made near the mouth, on the lips, on the nose, on different parts of the neck, under the chin, and on or near the chest, depending on the place of articulation and the location of any vibration; they are sometimes made in the signing space as well. All of the letters are accompanied by mouthing; that is, the Baghcheban alphabet uses more locations (Sanjabi et al. 2016).

Although Cued Speech and the manual alphabet system are different, they are to some extent similar in form and aim in that both methods help deaf people to communicate in sign language (Movallali 2009).

Sanjabi et al. (2016) compared the two systems and concluded that they are not completely alike. They imply that BMA is a natural language as it is typically used for words for which no signs already exist; moreover, the forms are sometimes lexicalized as signs; however, this is not the case with Cued Speech as a phonetic representation of Persian, although some modifications have been observed in ASL for articulatory play (Mirus 2014). Also, the BMA has one sign for each letter of the Persian alphabet, but Cued Speech does not have a sign for each sound (Sanjabi et al. 2016). The iconicity of some alphabet signs in BMA is considered another area of difference and thus rules out the possibility of deriving BMA from Cued Speech. Another dissimilarity has to do with the outcomes of the two systems; that is, BMA represents meaning, whereas Cued Speech represent the sounds or phonemes of any spoken language, including Persian. In addition, BMA is not produced in isolation but is used along with ZEI for communication (ibid.).

The authors make an interesting point about the sociolinguistic aspects of the two systems:

> [I]t is important to see how the Deaf community struggles with the name of the fingerspelling system. Names carry powerful weight and are instrumental to their identity. That some Deaf Iranians are upset about the attachment of the label "Cued Speech" to their manual alphabet indicates a sense of pride in both their own natural sign language, ZEI, and their Deaf community, as well as a wish to distance themselves from the oralist traditions. (ibid., 529)

Mouth-Hand System

Cued Speech is considered to be a widespread mouth-hand system. This approach, developed by Georg Forchhammer in Denmark in 1903, visually represents the phonemes or sounds of an oral language (Jepsen et al. 2015). Intended to help deaf students learn to speak in Danish, the system uses a single hand (see figure 7). It employs fourteen handshapes that represent Danish consonants, but there is no one-to-one correspondence (e.g., a single handshape indicates three letters: *p, f,* and *h*). Another handshape is used for *b, v,* and all of the vowels. The

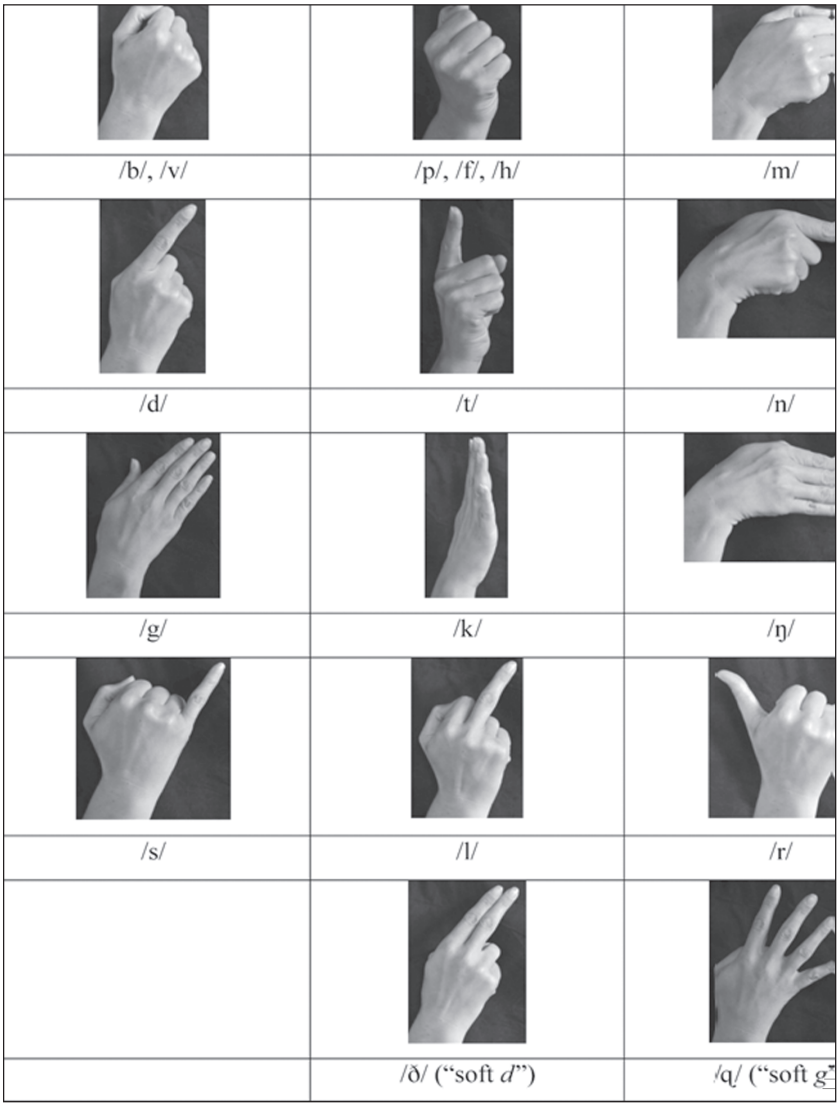


FIGURE 7. The Danish mouth-hand system.

stød (a creaky voice or glottal stop) is not presented in this system. The single hand is placed under the chin in order to facilitate lipreading

Although it was developed to help deaf individuals learn to speak Danish, the method uses several signs derived from Danish Sign Language (ibid.). Some of these show the written form of the Dan-

ish words, not spoken Danish. For example, a handshape shows a consonant that is not pronounced in spoken Danish. The Baghcheban manual alphabet also shows the written form of the Persian words although it was created mainly to facilitate speaking. It represents a one-to-one correspondence between handshapes and vowels, but it does not match the handshapes with the consonants. In addition, the handshapes are placed on different parts of the face or body and in the signing space.

Participants

The sample consisted of 45deaf participants: 27 males and 18females, ranging from18 to 49 years of age. They were selected from thirty-one provinces (see table 2 and figure 8). The participants were selected from the attendees at a deaf conference. The sample was stratified to obtain a representative sample based on the size of the province and its deaf population. For example, as the provinces of Tehran, Khorasan, and Mazandaran had more cities and larger deaf populations, more participants were included from the cities of these provinces. The educational background of the participants ranged from high school dropout to a master's degree (either a graduate or a student). The participants had both deaf and hearing families.

Two participants from Qom and two from Tehran were removed from the data because they did not fit the criteria for fluency in BMA; that is, they did not know all of the manual alphabets although they had a high school diploma and a bachelor's degree and were native signers. The participants were randomly selected (i.e., at a national deaf conference—different deaf individuals attended, depending on their personal schedule and the decision of the Deaf associations in their cities). Thus, the participants were selected based on their attendance at a conference. I then located the available participants from different cities and filmed them.

Method

I collected data from the participants from all provinces by recording them during breaks at a national deaf conference in Shiraz. Potential participants had been informed of the study at another conference of the Youth Council of Deaf People, held two months earlier. An interpreter helped with the filming process. The films were stored on

TABLE 2. Participants' Characteristics

City	Gender	Age	Education	Deaf/Hearing Family
Ahvaz	m	33	two years beyond diploma/junior college	deaf
Babol	m	39	two years beyond diploma/junior college	deaf
Bandar Abbas	f	31	undergraduate student	hearing
Bojnurd	m	27	undergraduate student	deaf
Bonab	f	18	high school student	deaf
Chalus	m	34	high school diploma	hearing
Esfarayen	m	45	no high school diploma	deaf
Eqlid	f	34	high school diploma	deaf
Gorgan	m	30	high school diploma	hearing
Isfahan1	m	48	high school diploma	deaf
Isfahan2	f	24	two years beyond diploma/junior college	hearing
Kerman	f	27	postgraduate student	deaf
Kermanshah	m	25	high school diploma	deaf
Khomeinishahr	m	36	no high school diploma	deaf
Lar	m	26	two years beyond diploma/junior college	deaf
Mahabad	m	28	two years beyond diploma/junior college	hearing
Maragheh	f	23	bachelor's degree	deaf
Marand	m	42	no high school diploma	deaf
Mashad1	m	32	high school diploma	deaf
Mashad2	f	33	high school diploma	deaf
Miandoab	f	18	no high school diploma (student)	hearing
Minab	f	24	undergraduate student	deaf
Najafabad	f	32	high school diploma	deaf
Qa'em Shahr	m	48	high school diploma	deaf
Qazvin	m	49	no high school diploma	deaf
Qom	f		undergraduate student	hearing
Sabzevar	m	45	high school diploma	deaf
Sanandaj	f	25	postgraduate student	hearing
Sari	m	23	undergraduate student	deaf
Savejbolaq	m	32	two years beyond diploma/junior college	deaf
Shahinshahr	m	27	high school diploma	hearing
Shahreza	m	31	no high school diploma	hearing
Shiraz1	f	37	high school diploma	deaf
Shiraz2	m	28	master's degree	deaf
Tabriz	m	20	no high school diploma (student)	hearing
Tehran1	m	31	bachelor's degree	hearing
Tehran2	f	28	master's degree	deaf
Tehran3	m	26	undergraduate student	deaf
Tehran4	f	23	bachelor's degree	hearing
Tonekabon	m	29	bachelor's degree	deaf
Yasuj	m	31	bachelor's degree	deaf
Yazd1	m	45	no high school diploma	deaf
Yazd2	f	47	high school diploma	deaf
Zahedan	f	42	high school diploma	hearing
Zanjan	f	34	high school diploma	deaf

Source: https://en.m.wikipedia.org/wiki/Geography_of_Iran#/media/File%3AIranOMC.png.

Figure 8. Map of Iran: Provinces and cities.

the computer according to the names of the participants' cities. Before filming, I wrote down the information given by the participants on other variables. The coding system was based on the variations I observed in handshape, location, orientation, and movement (see tables 3, 4, and 5); the more elements that were exposed to the variations of a letter, the more dissimilar the letter was from BMA. The data were transcribed with the help of three deaf signers in order to note all of the slight differences. Only the variations from BMA were written down or recorded; the ways in which they differed from BMA were explained.

Data Collection

The participants briefly reported their age, education, family background (deaf or hearing), and hometown. Then the formal data

collection took place, which lasted for about ten minutes per participant. Each participant was presented with a normally ordered list of the six vowels and the thirty-two consonants of the Persian alphabet. All of the participants followed the same order of letters and presented them one by one (with hands returning to neutral position between the articulation of letters) to make data analysis easier and to ensure that they did not omit any letters. In order to remove the impact of the participants' signing on each other, they were required not to watch each other if they were to be filmed (there was more than one deaf person from each city, so if one was watching, that person was not filmed).

Data Analysis

After the filming, the films were uploaded and stored on a computer. I transcribed the films with the assistance of three deaf native signers, one female and two males. The participants' productions of the thirty-eight letters of BMA were compared to each other and with the Baghcheban manual alphabet. Then they were classified according to changes in handshape, location, orientation, and movement (see tables 3, 4, and 5 for the coding scheme).

The productions of a few of the participants (e.g., one from Tehran) were similar to (but not exactly the same as) those of the Baghcheban manual alphabet. However, other participants also from Tehran, who were of similar age, the same gender, and similar family background and education, showed variations in some of the letters they signed. This means we should be very careful when drawing any conclusions about the effect of gender, age, education, family, and geographical distance.

Most participants needed to read from the paper on which the letters were listed so that they would not leave out any letters. This might have been because fingerspelling is infrequently used by Iranian signers, although the exact frequency of use needs to be systematically researched. Because participants were asked to articulate the letters individually, it was impossible to obtain data on coarticulation characteristics, for example. However, if the philosophy behind all of those processes is making pronunciation easier and faster, the manual alphabet is doing so as well.

Table 3. BMA One-Element Variations

BMA	Variations in Handshape	Variations in Location	Variations in Orientation	Variations in Movement
j /d͡ʒ/; *x* /x/; *d* /d/; *ʒ* /z/; *n* /n/; *ʂ* /s/; *ʐ* /z/;*ʈ* /t/; *ʐ* /z/; *q* /ɣ/, /ɑ/, or /ɑ/; ˈ *a* /æ/, *e* /e/, *o* /o /, *ā* /ɒ/	no variations			
u /u:/ the tips of the thumb, index, and middle fingers are together, palm forward in the signing space	*u* /u:/ index extended, palm down in the signing space			
I /I:/ moving diagonally away from body	*I* /I:/1 hand moves from left to right side of chest			
r/ɾ/ index and middle fingers are extended and spread apart	*r*/ɾ/1 using the whole hand			
l/l/ fist with thumb and little finger extended, palm forward	*l*/l/1 only little finger extended, palm faces forward or to left		*l*/l/2 the same as BMA, but palm faces body, or the same but palm diagonally down	*l*/l/3 palm turns from facing forward to facing body diagonally
m/m/ the flat hand is placed on the chest	*m*/m/1 the fist is placed on the chest			
p /p/ the flat hand is palm up, while the edge of the little finger touches the face near the mouth	*p* /p/1 all fingers are extended together and loosely curved, palm up	*p* /p/2 the flat hand touches the lips		
t /t/ flat hand, palm up, while the edge of the little finger touches the face near the mouth; the fingertips point to the left shoulder		*t* /t/1 the same as BMA but near the mouth	*t* /t/2 flat hand but with the fingertips pointing forward	
s /s/ the flat hand has palm down;the edge of the ring finger touches the face near the mouth	*s* /s/1 the third knuckle is bent, or the hand can simply be held loosely			
s /s/ the flat hand has palm down, while the edge of the ring finger touches the face near the mouth	*s* /s/2 only three fingers (i.e., index, middle, ring)			
s /s/ the flat hand has palm down, while the edge of the ring finger touches the face near the mouth	*s* /s/3 only three fingers (i.e., index, middle, ring), palm down, near the mouth and in the signing space			
s /s/ the flat hand has palm down, while the edge of the ring finger touches the face near the mouth	*s* /s/4/5 all fingers (or just the index, middle, and ring fingers) extended together and loosely curved; the palm faces the body while the fingertips touch the chin			

š /ʃ/ the flat hand has palm down while the edge of the ring finger touches the face near the mouth	*š* /ʃ/1 the third knuckle is bent, or the hand can just be held loosely			
f /f/ the flat hand has palm down,whlethe edge of the ring finger touches the face near the mouth	*f* /f/1 the fingertip of the bent index finger touches the chin			
v /v/ index bent, palm right, with fingertips touching the mid-chest				*v* /v/1 the same as BMA but with a forward movement
'/ʔ/ &*ġ* /ɣ/or /ɑ/ extended index and middle fingers, palm facing the body, touching neck/under the chin; for the former, the two fingers are extended together and for the latter they are spread apart		*'*/ʔ/ &*ġ* /ɣ/or /ɑ/1/2/3/4 the same handshape and orientation, but with changes in the location: on the left and the right, respectively; both on the left; on the left and on the chest; on the left and under the chin		
'/ʔ/ &*ġ* /ɣ/or /ɑ/ extended index and middle fingers, palm facing body, touching neck/under the chin; for the former, the two fingers are extended together and for the latter, they are spread apart			*'*/ʔ/ &*ġ* /ɣ/or /ɑ/5 the same handshape but with different orientations: the former with the palm facing the body, and the latter with the palm forward, both on the left side of the neck	
s̲ /s/ the index, middle, and ring fingers are extended, palm forward, under the chin, the edge of the ring finger is under the chin, and the three fingers touch in front of the neck		*s̲* /s/1 the same handshape as BMA, but touching the chin or the lips		
ž /ʒ/ placing the flat hand, palm forward, on the upperchest, fingertip of the little finger points toward the chin	*ž* /ʒ/1 the same but just the little finger and the thumb are extended; the other fingers freely dropping down	*ž* /ʒ/2 the same as BMA, but on the mid-chest		
č /t͡ʃ/ placing bent index, palm left, near the mouth with a small movement in a downward arc	*č* /t͡ʃ/1 placing index and middle fingers, palm left, near the mouth with a small movement in a downward arc	*č* /t͡ʃ/2/3 touching the chin; farther away from the mouth; in the signing space		
ḥ /h/ placing bent index, palm left, near the mouth		*ḥ* /h/1 the same as BMA in the signing space or near mid-chest		
g /g/ placing bent index and middle fingers, palm facing body, on the mid-chest	*g* /g/1 placing extended index and middle fingers on the left shoulder on the mid-chest			
g /g/ placing bent index and middle fingers, palm facing body, on the mid-chest		*g* /g/2 placing loosely extended index and middle fingers on the left shoulder		

Table 4. BMA Two-Element Variations

BMA	Variations in Handshape and Orientation	Variations in Location and Movement	Variations in Orientation and Movement	Variations in Location and Orientation
l/l/ fist with thumb and little finger extended, palm forward	*l*/l/4 only little finger extended, palm faces forward or left			
l/l/ fist with thumb and little finger extended, palm forward	*l*/l/5 palm faces body; little finger points down			
y /y/ tip of extended right index finger of flat hand, palm down, is placed on mid-chest (without any movement)	*y* /y/1 flat hand loosely curved, palm diagonally facing body, moving to diagonally facing up (similar to the shape of the Persian letter (ی)	*y* /y/2/3/4 like BMA but away from chest and usually accompanied by a movement: moving the hand twice in a clockwise or counterclockwise circle		
K /k/ placing flat hand palm up with the tip of the little finger touching the face near the mouth	*K* /k/1 placing hand with all fingers extended and loosely curved, palm down, near the mouth			
K /k/ placing flat hand palm up with the edge of the little finger touching the face near the mouth	*K* /k/2 placing fist, palm down, near the mouth		*l*/l/2 the same as BMA, but palm faces body, or the same but palm diagonally down	*l*/l/3 palm turns from facing forward to facing body diagonally
K /k/ placing flat hand palm up with the edge of the little finger touching the face near the mouth	*K* /k/3 placing hand with bent fingers, palm left, near the mouth			
v /v/ bent index, palm right, with the tip of index finger touching the mid-chest			*v* /v/2 the same handshape as BMA, but the bent index points diagonally down, bouncing from the wrist to the left, turning from palm forward to palm left, in the signing space	

s /s/
index, middle, and ring fingers extended, palm forward, are placed under the chin;the edge of the ring finger is under the chin, and the three fingers touch in front of the neck

s /s/2/3/4/5/6
the tips of the index, middle, and ring fingers are placed on the chin, palm facing the body; index, middle, and ring fingers, palm down, are placed under the lips; the edge of the ring finger touches the face; index, middle, and ring fingers, palm facing body, are placed in front of the chin with the tip of the index finger touching the chin; index, middle, and ring fingers are extended, palm down; the edge of the index finger touches the chin; index, middle, and ring fingers are extended, palm diagonally down, over left shoulder

č /t͡ʃ/
bent index, palm left, near the mouth, with a small movement in a downward arc

č /t͡ʃ/4
all fingers are extended, spread apart, and curved;palm up near the mouth

h /h/
flat hand has palm diagonally down, touching left side of the lips

h /h/1
flat hand is placed straight, not diagonally, on mid-lips

g /g/
bent index and middle fingers, palm facing body, are placed on the mid-chest

g /g/3
all fingers are extended and loosely curved, palm left, and placed near the mid-chest or touching it

v /v/
bent index, palm right, with the tip of the index finger touching the mid-chest

v /v/3
tip of the thumb, palm facing left, is placed on the mid-chest in order to distinguish it from *z* and *j*

Table 5. BMA Three- and Four-Element Variations

BMA	Variations in Handshape, Orientation, and Movement	Variations in Handshape, Location, and Orientation	Variations in Orientation, Location, and Movement	Variations in Handshape, Orientation, Location, and Movement
/l/ fist with thumb and little finger extended, palm forward (without movement)	/l/6 extended little finger, palm facing body, with the fingertip toward left shoulder, moving from up to down			
/l/ fist with thumb and little finger extended, palm forward,(without movement)	/l/7 flat hand, palm up, the fingertips facing forward and moving straight and upward (to show the tongue, whose tip is curled upward; also to indicate the configuration of the letter/ل/ in Persian			
t /t/ placing flat hand, palm up, with the edge of the little finger touching the face near the mouth		*t* /t/3 index and middle fingertips, palm facing body, on the chin (to show the two dots over ت in Persian)		
f /f/ flat hand, palm down, with the edge of ring finger touching the face near the mouth	*f* /f/2 index and thumb touching to form a circle, palm facing body, touching the chin			
f /f/ flat hand, palm down, with the edge of the ring finger touching the face near the mouth	*f* /f/3 the edge of bent index touches the chin, almost like a half circle			
f /f/ flat hand, palm down, with the edge of ring finger touching the face near the mouth	*f* /f/4 flat hand with thumb bent almost intoa circle, palm diagonally facing body, touching the chin			
f /f/ flat hand, palm down, with the edge of ring finger touching the face near the mouth	*f* /f/5 fist with loosely curved thumb, palm facing body, on the chin			
v /v/ bent index, palm right, with the tip of the index touching the mid-chest	*v* /v/4 similar to the BMA but with extended index			
v /v/ bent index, palm right, with the tip of the index touching the mid-chest		*v* /v/5 bent index, palm diagonally down, in the signing space		
v /v/ bent index, palm right, with the tip of the index touching the mid-chest				*v* /v/6 all of the fingertips and the thumb touching, palm up, with a short up-down movement in the signing space

z /z/
bent index, palm right, with the tip of the index touching the mid-chest

z /z/
bent index, palm right, with the tip of the index touching the mid-chest

s /s/
index, middle, and ring fingers extended, palm forward, placed under the chin, the edge of ring finger under the chin and the three fingers touching in front of the neck

h /h/
flat hand, palm diagonally down, touching the left side of the lips

h /h/
flat hand, palm diagonally down, touching the left side of the lips

h /h/
flat hand, palm diagonally down, touching the left side of the lips

v /v/
bent index, palm right, with the tip of the index finger touching the mid-chest

K /k/
flat hand, palm up, with the edge of the little finger touching the face near the mouth

g /g/
bent index and middle fingers, palm facing body, on the mid-chest

K /k/
flat hand, palm up, with the edge of the little finger touching the face near the mouth

K /k/
flat hand, palm up, with the edge of little finger touching the face near the mouth

K /k/
flat hand, palm up with the edge of little finger touching the face near the mouth

z /z/1
index and middle fingers extended and crossed in the signing space

z /z/2
flat hand, fingers extended and together, touching the right cheek

s /s/7
all fingertips extended together and loosely curved, palm facing body, touching the chin

h /h/4/5/6
tips of the thumb and the index finger touching (while the other fingers are loosely closed) to form a circle; they are placed on the mouth/in the signing space/mid-chest

h /h/7
right hand forms a fingerspelled c, palm facing body, and placed in front of the chin

K /k/4/5
extended index, palm facing forward, in the signing space/right side of the body; with the extended thumb, index, and middle fingers

g /g/4/5
extended index and middle fingers together, palm faces forward, in the signing space or with the extended thumb and index

K /k/6
hand with all fingers extended and loosely curved, palm down, in the signing space

K /k/7
fist, palm down, in the signing space

K /k/8
hand with bent fingers, palm left, in the signing space

v /v/7
same handshape as BMA, but the bent index is diagonally down and bounces from the wrist to the left, turning from palm forward to palm left, in the signing space

h /h/2/3
thumb and index finger open and then moving in an arc while closing to form a circle (to depict the shape of), palm up and forward, in the signing space

Those participants with deaf parents, siblings, and spouses were more fluent than the other participants and presented more variations in order to facilitate communication; this was naturally due to their greater use of sign language and BMA. By "fluent," I mean that that they could sign without pauses and hesitations.

With regard to distance, the closer the participants' cities were, the more similar were their variations, although the impact was unimportant(e.g., participants from Eqlid and Shiraz produced *s* /s/ by placing all fingertips extended together and loosely curved, palm facing body, touching the chin; those from Sari and Chalus articulated *k* /k/ by placing the hand with all fingers extended and loosely curved palm down, near the mouth; those from two cities in Azarbaijan produced *k* /k/ and *g* /g/ in a manner that was similar to Mohsen Mousavi's alphabet letter (see figure 3): *k* with extended index, palm facing forward, in the signing space/right side of the body, *g* with extended index and middle fingers together, palm facing forward, in the signing space; or both with the extended thumb and index finger; those from two cities from Azarbaijan produced *f* /f/ similarly: the flat hand with thumb completely bent like a circle, palm diagonally facing body, touching the chin; fist with loosely curved thumb, palm facing body, on the chin. However, in the majority of cases, the productions by the participants from the two most distant cities were similar to the alphabet letters (e.g., Mashad and Isfahan for /k/), whereas those of the participants from nearby cities were different (e.g., Esfarayen and Mashad for /l/).

The most valuable finding from this study, which is also its main purpose, is related to the natural variations in similar letters. These similarities, as explained earlier, have led to misunderstanding or miscomprehension among Iranian signers. This is a particularly relevant issue at large conferences or when two signers are physically distant from each other. As the phonetic alphabet of Baghcheban was based on sound, and the letters were classified chiefly according to the place of articulation, they had similar handshapes and locations. The only variable that differed was the lips or the mouth, which was not clear or observable at a distance and in dim light. In addition, even under favorable conditions, deaf signers have problems reading lips. This issue has naturally led deaf individuals to change the production of

similar letters to facilitate communication. Thus, the signers adapted the phonetic alphabet to the alphabetic BMA.

Fourteen letters showed almost no changes in their production: *j* /d͡ʒ/; *x* /x/; *d* /d/; *z̲* /z/;*n* /n/; *ṣ* /s/; *z̤* /z/;*ṭ* /t/; *ẓ* /z/; *q* /ɣ/, /ɢ/, or /q/and the four vowels: *ʾ a* /æ/, *e* /e/, *o* /o /, *ā* /ɒ/. Five other consonants and the vowels *u* /u/ and *I* /I/ showed slight variations (e.g., *ḥ* /h/, *r* /r/, *š* /ʃ/*m*/m/) (tables 3, 4, and 5).

In BMA, the vowel *u* /u/ is produced by placing the tips of the thumb, index, and middle fingers together, palm forward, in the signing space. The only variation is this: index extended, palm down, in the signing space. This is to readily distinguish the vowel from *o* /o/, which is the same, although the fingers do not touch each other. Additionally, the written form of this vowel is similar to that of the word for "he," "she," or "it" in Persian (i.e.,او); thus, it was produced in the same manner as the sign for these words (image 1).Note that, in Persian, the same pronoun is used for "she," "he," and "it."

In BMA, the vowel *I*/I/ is produced by flat hand, palm down, moving diagonally away from the body. Small changes were also shown by placing the same handshape in front of the left side of the chest, with the edge of thumb near the body and moving it toward the right side of the chest. The participant from Gorgan produced this vowel as follows: thumb and little finger extended from fist, palm facing body, moving toward the right (the handshape and location were like those

Image 1. *u* /u:/. Please provide a descriptive caption for this image and for the rest of the images in .

in Mousavi's adapted alphabet, but the orientation was the opposite: Mousavi's was palm forward and without movement). So even in the latter case, the tendency is toward the ease of communication with changing orientation.

In BMA, the letters *Č* /t͡ʃ/ and ḥ /h/ are similar in production but with a slight difference: They are articulated by placing the bent index either palm left and near the mouth, like their respective shapes in Persian ڃ and ڇ. The former makes only a single movement in a small downward arc. The variation of ḥ is only in location (i.e., in the signing space or near mid-chest). The variations of *Č* are small changes in location: touching the chin; farther away from the mouth; in the signing space; or using the index and middle fingers as handshapes; all of the fingers are extended, spread out and curved, palm up near the mouth.

In BMA, *r*/r/ is pronounced by the index and middle fingers extended and spread apart in front of the mouth and making flicking movements. The only variation observed was in the handshape using the whole hand (image 2).

In BMA, the letter *m*/m/ is produced by placing the flat hand on the chest. The only variation occurred when the handshape involved placing a fist on the chest (image 3). The participant from Gorgan again used Mousavi's adapted alphabet to produce *m*/m/ by using the thumb and index fingers extended together, palm down, and the fingertips pointing down.

Image 2. *r* /r/.

Image 3. *m* /m/.

In BMA, the letter ز/z/ is produced by the index finger and the thumb loosely extended at right angles, palm diagonally down, like its shape in Persian ز, on the mid-chest. A few variations were found: The participant from Gorgan used the index and middle fingers loosely extended together at a right angle to the thumb, palm left, in the signing space. This resembled the letter in the manual alphabet adapted by Mohsen Mousavi.

Producing the alphabet in the signing space seemed to be easier for the signers, so in order to make it different from *d*/d/ (in Persian ذ), which, in BMA, is exactly the same as ز but in the signing space, the participant from Gorgan added the middle finger (to show the dot over the letter). This participant had attended a special class in which this system was taught, but he used BMA as well due to his contacts and social relationships with other deaf individuals. Thus, the variations that resembled the letters of Mohsen Mousavi's adapted alphabet were removed from tables 3, 4, and 5.

A unique variation of ز/z/ was produced by the participant from Savejbolaq (image 4); that variation resembled the letter in BMA, but, in producing it, the left hand made the same handshape on top of the right hand, so that the left thumb nearly touched the right index finger (to show the dot over the letter). This might be considered an idiosyncrasy of the participants because no one else produced the letter as he did. (Thus, it was not reported in tables 3, 4, and 5).

Image 4. *z* /z/.

In BMA, the letter *n*/n/ is produced by placing the index finger extended from the fist on the right side of the nose (to show the nasalization of the sound), palm diagonally down. All of the participants followed BMA, except the participant from Gorgan, whose production resembled that in Mousavi's adapted alphabet: curved hand, thumb at the side (to suggest its shape in Persian /ن/), palm up, in the signing space.

In BMA, the letters *p,t,k* are produced in the same way, by placing flat hand, palm up, with the edge of the little finger touching the face near the mouth, along with mouthed variants for each letter. The variations of *p*are as follows: all fingers extended, together and loosely curved, palm up. Other variations are these: *t,* flat hand; *p,* flat hand touching the lips; *t,* near the lips (generally *p* comes closer to the mouth [so as to feel the exhaled air] and moves slightly away from the mouth); using the flat hand for *p* while the edge of the little finger is near the body; however, for *t,* the fingertips point forward; *t* the tips of the index and middle fingers, palm facing body, on the chin (to show the two dots over the letter in Persianت), which is a good differentiation (images 5, 6, and 7).

The majority of the participants produced a different articulation for *k* and differentiated it from *p* and *t* by placing the hand with bent

Image 5. *p* /p/.

fingers (image 8) or a fist (image 9), palm down, near the mouth or in the signing space; or by using the same handshape as the former, but with a change in the orientation to palm left (image 9); placing extended index finger, palm facing forward, in the signing space or at the right side of the body; placing the extended thumb, index, and middle fingers, palm facing forward, in the signing space (the last two are similar to Mohsen Mousavi's adapted alphabet).

In BMA, the letters *s*/s/, *š*/ʃ/, and *f*/f/ are similarly articulated by placing flat hand, palm down, with the edge of the ring finger touching the face near the mouth, along with mouthed variants for

Image 6. *t* /t/.

Image 7. *t* /t/.

Image 8. *K* /k/.

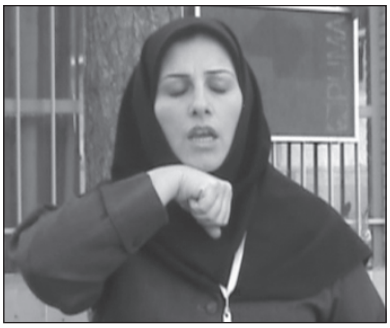


Image 9. *K* /k/.

each letter. Variations of both *s* /s/ and *š* /ʃ/ are bending at the third knuckle or just keeping the hand loose; the same as BMA, but three more variations for *s:* using only three fingers (i.e., index, middle, ring); all fingers/just index, middle, and ring fingers extended together and loosely curved, palm facing the body, the fingertips touching the chin; only three fingers of index, middle, ring, palm down, in the signing space.

Variations of *f:* bent index, the fingertip touching the chin; index and thumb touching to form a circle, palm facing the body, touching the chin; the tip of bent index touching the chin, almost like a half circle (the circle shows the shape of the Persian letter ف)(image 10); the flat hand with thumb completely bent like a circle, palm diagonally facing the body, touching the chin (image 11); fist with loosely curved thumb, palm facing the body, on the chin (image 12).

Image 10. *f* /f/.

Image 11. *f* /f/.

Image 12. *f* /f/.

In BMA, the letters *j, z,* and *v* are produced by bent index, palm right, with its fingertip touching the mid-chest. Variations of *v* are as follows: placing the tip of the thumb, palm left, on the mid-chest in order to distinguish it from *z* and *j* (image 13); similar to the BMA but with extended index; the same handshape as BMA, but the bent index is diagonally down and bouncing from the wrist to the left, turning from palm forward to palm left, in the signing space (this is sometimes used as a sign in ZEI meaning "and"; this single letter, along with the vowel ʾ *a* /æ/ in Persian, means "and") (figure9,picture 14); bent index, palm diagonally down, in the signing space but without movement (the bent index resembles its shape in Persian ع); the same as BMA but

Image 13. *v* /v/.

Image 14. *v* /v/.

with a forward movement. The production by the participant from Mahabad was totally different: all the fingertips and the thumb were touching, palm up, with a short up-down movement in the signing space (image 15).

A distinctive articulation was also given for *z:* index and middle fingers extended and crossed in the signing space. The participant from Mahabad produced it in this manner: flat hand, fingers extended and together facing and touching the right cheek (the tip of fingers pointing up). This variation might be an idiosyncrasy of this particular person, but it illustrates a tendency toward the distinguishing feature.

Image 15. *v* /v/.

Image 16. ʿ/ʔ/.

Image 17. ġ /ɣ/ or /g/.

In BMA, the letters ʿ/ʔ/ and ġ /ɣ/ or /g/,ع and غin Persian are produced by extending the index and middle fingers, palm facing body, touching neck or under the chin; for ʿ/ʔ/and ġ /ɣ/,the two fingers are extended together, and for ع and غthey are spread apart. The variations of the letters were significant, which might be due to their incomprehensibility: These two letters are produced with the same handshape but with different orientations: the former with the palm facing the body and the latter with palm forward; both variations are made on the left side of neck (images 16 and 17).The majority of the participants used the same handshape and orientation but changed the location: One was made on the left side of the neck, and the other was made on the right side; both were made on the left side of the neck; one was made on the left side of the neck and the other was made on the chest; one was made on the left side of the neck and the other was made under the chin.

The letters *s̲*/s/ and *ž*/ʒ/ are the most infrequently used letters of the alphabet (I explain this in more detail in the discussion). Therefore, some of the participants did not know the letters; they either left them out, produced them incorrectly, or produced both similarly (e.g., like *s̲* or *ž*).The participant from Ahvaz did not know the letter *ž* and produced it like an *l* /l/; The participant from Tonekabon did not know *s̲;* the participants from Bandar Abbas, Bojnurd, Qom, and Esfarayen produced both *ž* and *s̲* similarly and like *ž* (the same as BMA), but they used the chin as the location (they were unsure how

to produce it); the participant from Sari produced both like *s̲;* the participant from Sanandaj, although she knew the correct production of *ž,* totally forgot it and signed it like *s̲.* She quickly realized her mistake and asked me to film her again for that letter. Variations of both *s̲* and *ž* are mostly a change in location or orientation since it is these two elements that made the production of the letters difficult or uncomfortable.

In BMA, the letter *s̲* is produced by placing the extended index, middle, and ring fingers, palm forward, under the chin, the edge of the ring finger under the chin, and the three fingers touching in front of the neck. Variations for *s̲* are these: the same handshape as BMA, but touching the chin or the lips; placing the tips of the index, middle, and ring fingers on the chin, palm facing the body; all fingertips extended together and loosely curved, palm facing body, touching the chin (image 18); index, middle, and ring fingers palm down, placing the edge of the ring finger under the lips and touching the face; placing index, middle, and ring, palm facing the body, in front of the chin, with the

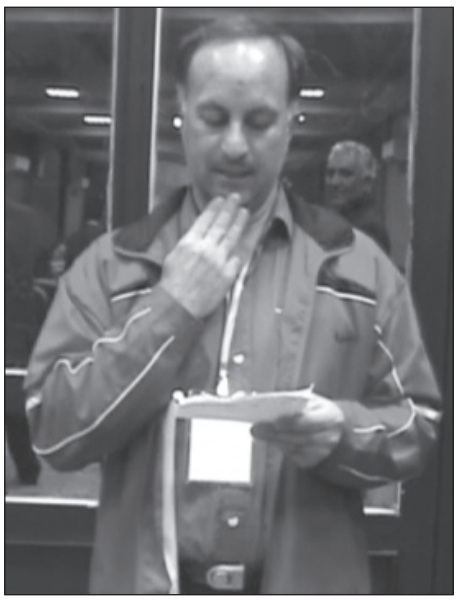


Image 18. *s* /s/.

tip of the index finger touching the chin; index, middle, and ring fingers extended, palm down, the edge of the index finger touching the chin; index, middle, and ring fingers extended, palm diagonally down, over the left shoulder.

In BMA, the letter *ž* is pronounced by placing the flat hand, palm forward, on the upper part of the chest, the tip of the little finger toward the chin. Variations for *ž* are these: the same but only the little finger and the thumb are extended, while the other fingers are freely dropping down (image 19); the same as BMA, but on the mid-chest.

In BMA, the letter *g* is produced by placing the bent index and middle fingers, palm facing the body, on the mid-chest. Variations are as follows: the same as BMA but with extended index and middle fingers; placing the extended index and middle fingers on the left shoulder; placing all fingers extended and loosely curved, palm left, near or touching the mid-chest; placing the extended index and middle fingers, palm facing forward, in the signing space or at the right side of the body; placing the extended thumb and index fingers, palm facing forward, in the signing space (the last two are similar to Mohsen Mousavi's adapted alphabet). Several signers articulated *g* and *k* similarly, with the location of *g* near the body and *k* in the signing

Image 19. . ž /ʒ/.

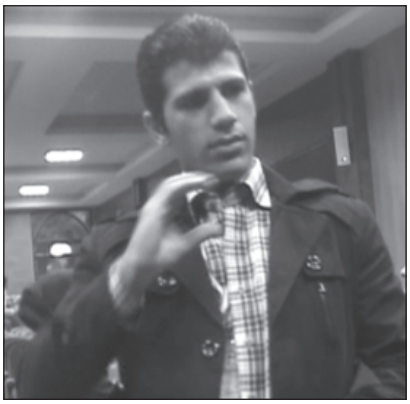


Image 20. *k* /k/.

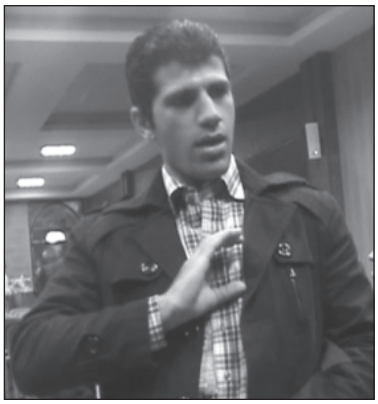


Image 21. *g* /g/.

space; they did so because their shapes in Persian,گوک for *g* and *k,* respectively, are similar, with only a slight difference (images 20 and 21).

In BMA, *l* /l/is articulated by placing a fist with the thumb and little finger extended, palm forward, in the signing space.[4] The variations consist of: the same as BMA, but palm facing the body, or the same way but palm diagonally down; only the little finger extended, palm forward or left (image 22); palm facing the body with the little

Image 22. *l* /l/.

finger pointing down; with a turn from palm forward to palm diagonally facing the body; extended little finger, palm facing the body, with the fingertip toward the left shoulder and moving from up to down; flat hand, palm up, the fingertips forward and moving straight and upward (to show the tongue with an upward curl on its tip; also to indicate the configuration of the Persian letter /ل/, as the participant noted); tracing the shape of the letter in the signing space (this last variation was evident in the productions of participants from two nearby cities in Azarbaijan).

In BMA, the letter *h* /h/ is articulated by placing a flat hand, palm diagonally down, touching the left side of the lips. The variations are as follows: placing a flat hand straight up, not diagonally, in the middle of the lips (image 23); thumb and index finger open and then moving in an arc while closing to form a circle (resembling its shape,ه), palm up/forward, in the signing space; tips of the thumb and index finger together (while the other fingers are loosely closed) to form a circle that is being placed on the mouth or in the signing space or in the mid-chest region without movement (image 24); fingerspelling C with the right hand, palm facing body, and placing it near the mouth (probably meant to be a semicircle, which is easier to make and takes less time than a full circle) (image 25).

Image 23. *h* /h/.

Image 24. *h* /h/.

Image 25. *h* /h/.

In BMA, the letter *γ*/ɣ/ is produced thus: The edge of the extended right index finger of a flat hand, palm down, is placed on the mid-chest (without any movement). Variations are these: The majority of productions resemble the letters of the BMA, but they are made away from the chest and are usually accompanied by a movement: moving the hand from right to left; moving the hand in a circle twice. The majority of productions move from left to right (the configuration of the letter *γ* in Persian,ی, is similar to that of the vowel *I* in Persian,ـی, so the majority of the participants moved their hands diagonally from left to right) (images 26 and 27); flat hand loosely curved, palm down, moving in a small arc while diagonally facing the body (similar to the shape of the Persian letterی) (images 28 and 29).

The participants reported that they had made up some new manual letters because some of the letters in Persian, including *h*, ʿ/ʔ/, and ġ /ʁ/or /ɢ/, have very different shapes when they are placed in the initial, medial, and final positions (see table 1). This also demonstrates the signers' tendency to move from the phonetic BMA to the alphabetic BMA. That is, although these letters were manually created and were not based on sound, more varieties of them exist in order to indicate the different shapes they assume according to their position in a word.

In the data, the letters ṣ, ẓ, ṭ, and ẓ underwent no changes; s̲ and z̲ showed slight and unimportant changes.

Image 26–27. *y*.

Table 6. Summary of the BMA Variations

Variations	Number of Variations	Number of Variations	Number of Variations	Totals
Table 3 Handshape	16 Location,	13 Orientation	3 Movement	2 34
Table 4 Handshape, Orientation	9 Location, Movement	1 Orientation, Movement	1 Location, Orientation	6 17
Table 5 Handshape, Orientation, Movement	7 Handshape, Location, Orientation	11 Movement, Location, Orientation	1 Handshape, Location, Orientation Movement	3 22

Is this table formatted correctly?

Image 28–29. *y*.

Discussion

The study of variations in BMA led me to explore natural diversity among the native signers all over Iran. By "natural" I mean that the variations have not been made up by linguists or other experts to differentiate between signs or to facilitate communication; they appear to be innately based on deaf people's needs. In fact, my goal was to find out whether any variations exist in BMA. The basic objective was to see whether any systematic changes have taken place in BMA variations. The findings indicate (1) a consistent pattern in the variations, (2) the unimportance of variables (e.g., age, education, gender, distance) on the variations, and (3) an extensive range of similarities among the productions of signers from all over Iran due to the developing Deaf communities.

The findings are summarized in tables 3, 4, and 5and are based on whether the variations are different from BMA in only one element (e.g., handshape), two elements, or three to four elements. The number of variations for each letter is different; the letters *l* and *k* have the most variations (eight), and u:, *I:, r, m, h,* and *š* /ʃ/ have the fewest (one). Undoubtedly by increasing the number of participants and including smaller cities and towns, the number of variations will increase. However, this study does not aim to determine the number of variations; rather, it intends to study the reasons for and the nature of variations that systematically emerge and lead to facilitating communication among deaf people. The large number of variations for *h* is the result of the different shapes of the letter in the Persian alphabet, which, as mentioned earlier, in turn results from its appearance in the initial, middle, or final position of a word.

The careful analysis of the data shows that the purpose of changes and adaptations has been to facilitate communication among signers. This issue in turn indicates that the manual alphabet is being exposed to modifications in a natural process similar to those found in language.

Most of the variations (thirty-four) occurred in a single element (table 3), the second greatest number of variations (twenty-two) took place in two elements (table 4), and the fewest variations (seventeen) were found in three to four elements (table 5; see also table 6). The

total numbers of variations in the three tables show that most of the variations involved handshape (forty-six) and orientation (forty-one). The next highest numbers involved location (thirty-five) and movement (fourteen).

Handshapes may be classified as simple handshapes, which consist of flat hands with all fingers extended (either lax or spread), fist, or index finger extended from a fist. These need only gross motor control and are thus learned earlier than more complex handshapes, which require fine motor control (Lillo-Martin 2008). Therefore, we can conclude that the high frequency of difficult or complex handshapes in BMA (seventeen out of a total of thirty-eight) led the signers' to use easier or less complex handshapes in order to facilitate communication. However, due to the unequal number or distribution of difficult or uncomfortable handshapes, orientations, locations, and movements in BMA, we cannot determine which handshape was more difficult to produce and whether a signer would prefer one particular handshape over another.

The difficulty of both handshape and orientation accounts for the greatest number of variations for *l* /l/ (eight). However, as distinguishing feature seemed to be more important tothe signers, the majority of the changes in the handshape were slight in order to keep the original and distinct feature of the handshape in *l* /l/. The same issue is also relevant to*k* /k/: The number of variations in handshape, orientation, and location, regardless of the original production, which was simple and comfortable, indicated the signers' tendency to make *k* /k/ dissimilar to other letters (I explain this issue later).

The more elements are involved in a variation, the more the letter deviated from BMA. This is because, when the production of a letter changes in two, three, or four elements, it naturally becomes more different. On the whole, three main factors clarify the occurrence of the variations.

The most important factor is the sameness and similarities of the letters. Most of the variations occurred in the production of twelve letters (out of thirty-eight): All three groups of letters (i.e., *p* /p/, *t* /t/,*k*/k/;s /s/, *š* /ʃ/,*f* /f/, and *z* /z/,*j* /d͡ʒ/, *v* /v/)are articulated in exactly the same way in BMA;*Č* /t͡ʃ/ and ḥ /h/' are similar(with a slight difference: The former has only a short extra movement)(see

figure4). In addition, /ʔ/ and ġ /ɣ/ or /ɢ/are also produced with similar handshapes (the first letter has fingers together; the second letter has fingers spread apart). With all other elements in common, the inconsequential differences in movement or handshapes caused the signers to naturally change them. It is worth noting that the original production of one of the similar letters in each group was always kept unchanged or exposed to minor changes, and the other two changed in order to be dissimilated (i.e., *p* /p/, *š* /ʃ/, *j* /d͡ʒ/,ḥ /h/, and ġ /ɣ/ or /ɢ/ were not changed).

The changes discussed here have occurred in the four elements of orientation, location, movement, and handshape in order to make them distinctive (e.g., *p* with a loosely curved flat hand [or *p* with a flat hand touching the lips]is recognized as different from *t* with a flat hand). The variations of *t* are more distinct because they involve more elements (e.g., orientations, handshapes) that distinguish them from the BMA: *t* with flat hand but with the fingertips pointing forward rather than toward the left shoulder; also, *t* with the tips of the index and middle fingers, palm facing the body, on the chin. The letter *k* showed the most changes: three elements—handshape, orientation, and location. Also, the letter *v* was made with the thumb rather than with the index finger in order to differentiate it from *j* and *z*; *Č* was made with a forward movement to differentiate it from ḥ; and ʿ and ġ were made with two different locations (e.g., one under the chin and the other on the left side of the neck (see table 3).

The second factor was the difficulty of production, which occurred in all of the basic elements (i.e., handshape, orientation, location, movement). This issue becomes more evident when a letter is produced in actual communication. The need that interlocutors feel to sign at a faster rate, which is in fact a normal rate during communication in any language, prompts them to make use of several phonological processes to simplify the production or pronunciation of complex words (e.g., see Sutton-Spence, Woll, and Allsop 1990; Schembri and Johnston 2007). Although in this study the participants were asked to articulate the signs out of context, their productions were the result of their life experiences.

Generally, the handshapes that needed to be finely controlled were replaced by those that required only gross control (e.g., the index and

middle fingers changed to the whole hand for *z)*. The handshape for *s* (i.e., index, middle, and ring fingers) changed to the flat hand, which was loosely curved. The loosely curved, crooked, or bent handshape was used instead of the extended fingers or flat hand. The other difficult handshape was *l,* which was kept unchanged by a majority of the participants because it was distinctive, with an alternative shape of only the little finger to make it easier.

Another systematic or consistent pattern was observed in location. Some variations involved changing the location from contacting the body or face to taking place in the signing space (more accurately, in the middle of the signing space) or moving from the face or the upper parts of the body to lower parts of the body (e.g., the production of *ž* might move from the upper chest to the mid-chest). The finding of variations in BSL also indicates changes in the location of signs (e.g., moving away from the periphery of signing space; assimilating handshapes in compound signs) (Woll and Sutton-Spence 2005).

In addition, the orientation of palm forward seems difficult or uncomfortable to produce; thus, it changed to other orientations, including palm facing the body, up, or down. Interestingly, the signers showed a tendency to utilize a diagonal orientation even though it was so small that it could not be readily perceived. Apparently, keeping the hands at right angles demands more energy than not doing so, and both the signer and the communicative interlocutor were not sufficiently interested in observing the strict rules of letter production as long as they could convey their message.

For the same reason, the signers were more inclined to use loosely curved fingers instead of a flat hand. For instance, instead of using a flat hand for the letters *s* and *š,* they preferred to bend their hand at the third knuckle to make production easier. The bent index changed to loosely bent. The creation of distinguishing differences for *p* and *t* by changing the handshape of *t* into a loosely curved hand (while keeping the first in a flat but relaxed handshape) is an example of this. To produce *ž,* only the little finger and the thumb are extended, while the other fingers freely drop down (rather than extending all of the fingers).

As for movement, the findings show that small movements changed to larger ones to make letters more distinctive (e.g., the movement

of the vowel *I: ;*the movements added to letters that have no movement, such as *Č* [to differentiate it from ḥ]; the movement added to *v* to differentiate it from *j* and *z).*

The results of the study indicate that distinction was more important to the signers than were other factors, including difficulty of production, frequency, and letter configuration. For instance, any contact with the body or face (as opposed to using the signing space) was felt to be unnecessarily difficult and time consuming; signs produced on the mid-chest (usually without touching the body) were preferred to signs that were produced on the right or the left; signs with simple handshapes, including flat hand, index finger, or fist, were felt to be more convenient than those with more complex handshapes, such as a fist with two or three extended fingers (index, middle, and ring fingers). In addition, loosely curved, crooked, bent handshapes, and handshapes with spread-out fingers were felt to be more easily produced than were extended and together/closed handshapes; palm facing the body/left/right (particularly in a diagonal position) was considered easier than palm forward.

However, the priority was the differentiation of letters. That is, if two letters were produced similarly, the signers preferred to make them different—even though the result might be more difficult to produce—from one another(e.g., by using a forward orientation or adding a movement).Some participants used extended index, middle, and ring fingers for *s* rather than a flat hand to distinguish it from *š*. The orientation of *ž* /ʒ/ was left unchanged, but some changes (as mentioned earlier) were made in its handshape to simplify it.

The third factor concerns the frequency of occurrence of the alphabet letters. Frequency of occurrence also played a significant role in the changes and the participants' knowledge of the letters. The letters *s̲* /s/ and *ž*/ʒ/ have the lowest frequency of occurrence in the Persian alphabet. Of the words that appear most frequently in the media, the frequency of *ž* was reported to be the lowest (i.e., 388 times out of 418,511 Persian alphabet letters), which means that its probability of occurrence is 9 out of 1,000 (Rajaei 2010, p. 65). Then the letter *s̲*, which occurred 561 times out of 418,511 letters, was determined to be the second least frequent alphabet letter (ibid.). Furthermore, these two letters, due to the use of forward orientation and location (i.e.,

under the chin and touching the body) were considered difficult as well.

Consequently, the majority of the participants skipped these letters, produced a single form for both, or created a totally wrong form. These were removed from the data as a variation. The other participants made these letters simpler by changing their orientation and location. This also indicates that the signers paid more attention to the Persian written form rather than to the phonetic features because the signers were not familiar with *s̲* although its sound was exactly like *s* and *ṣ* (but its shape was different).

Finally, although BMA was a phonetic alphabet invented at the time of oral dominance, the signers felt more comfortable producing letters that resembled their shapes instead of feeling the vibration (by touching their body), an explosion of air, nasalization, the place of articulation, including the lips (bilabials and labiodentals), and other phonetic features related to oral languages. Even the five participants who grew up with the oral system tended not to pay attention to the phonetic features for the production of the letters and instead embraced the natural variations, produced by the other signers, which facilitated and speeded up their communication. As a result, the participants adapted the phonetic system based on the local/Persian written form (e.g., *k, g, f, l, v, h, y).*

The handshapes of the nine letters *s̲, z̲, ṣ, ẓ, ṭ, ẓ, ʿ, ġ, h,* which were manually created, not based on sounds or phones, underwent minor changes eitherto merely cover the varieties used in the Persian alphabet (for *h*) or to facilitate communication (e.g., *s̲, ʿ, ġ, h*). This result indicates that the changes suggest a tendency to make the BMA manual because the greatest number of changes appeared in those letters that were created based on sound.

The variables of gender, age, and education did not have an important effect on the signers' production. However, those participants who had deaf parents, siblings, or spouses were more fluent because they spent more time signing and fingerspelling (using the manual alphabet) and because of the positive attitudes of their family.

Distance had an influence, although not a considerable one, on the variations; the nearer the signers are to each other, the more often they can get together; thus their signing is more similar. In addition,

the growing number of deaf gatherings in Iran, which I usually attend, present an opportunity for signers to exchange their variations. After the filming project, the participants talked to me about their knowledge of letter productions used in other cities and towns and the reasons for them; one explanation was that certain variations facilitated communication. Their appreciation of each other's variations was very pleasing; such an attitude is likely to further their relationship.

An example of the impact of distance is seen in the productions of *h, z,* and *v* in Mahabad, which were very different from those used in cities far away, including Tehran and Qazvin. Participants from the cities of one province or two adjacent provinces (e.g., Tonekabon and Sari; Eqlid and Shiraz; Bandar Abbas and Ahvaz; or Mashad, Bojnurd, and Esfarayen) produced similar letters and variations. However, the impact of distance was inconsistent and thus was not considered a major factor in the variations. This was because deaf people in all cities have opportunities to attend numerous sports events, social gatherings, educational institutions, and so on. Accordingly, the other reasons mentioned earlier had more of an impact than did distance.

This is why deaf people throughout Iran used certain variations of *h* that resembled the shape of the letter or changed the location of the same letter in BMA (from the left side of the lips to the mid-lips). They also used the thumb rather than the index finger for *v;* changed the orientation of *k* from palm up to palm down; or changed the production o*ff* from a flat hand, palm down, to the tip of the index finger on the chin(to distinguish *f* from *s* and *š*). Moreover, sometimes two signers from the same city made different productions of the same letter (e.g., two signers from Yazd produced *s̲* /s/ differently: one followed BMA, and the other one used palm forward). This was also the case with Tehran, Isfahan, and other cities from which two signers were participants.

Needless to say, the diversity of variations would likely be greater than what was found in the study if the number of the participants and cities were larger. However, the deaf conferences (held four times a year in Iran), the increasing number of gatherings, and the growing number of interpreters have significantly increased the similarity of production of the BMA letters and sign language. Certain changes are being gradually adopted (e.g., acceptance of the variations of *k*

throughout Iran); further research is required to explore the dissimilarities of the remaining letters and any adoption of variations by the Iranian deaf community.

A specific variation might occur in a certain city because of the life styles of its inhabitants, additional sociocultural characteristics, and particular psychological and physical features. These issues require further study.

In sum, the variations found in this study reveal the signers' tendency to change similar letters in order to make them more distinguishable, thereby facilitating communication. They appeared to prefer to make the letter productions as easy as possible (e.g., keeping hands or fingers loose; changing the production location from the body to the signing space; orientation from palm forward to palm facing the body; right angle to diagonal angle).

Conclusion

Considering the fact that linguistic phenomena are dynamic, flexible, and subject to rapid changes, the research on variations in the manual alphabet can give us insight into the nature of diversity in language. Such understanding may suggest that language rules are prone to modification rather than fixed for all time.

This analysis of the BMA adaptations reveals that, although a one-to-one representation of alphabetical symbols exists and is completely different from sign language in modes of communication, the handshapes or configurations are similar to those of sign language. This shows that the BMA is responding to the natural process of variation in language. It confirms the fact that variation is an integral component of any language and should not be considered as an abnormality (Lucas, Bayley, and Valli 2003).

This study meets the growing needs of the educational centers of ZEI, ZEI teachers, ZEI interpreters, and linguists who wish to learn generally about the dynamic aspects of ZEI and BMA in particular. Consequently, its specific implications can also further the teaching and assessment of BMA. In addition, any awareness of sign language as a full-fledged language contributes to the empowerment of the Deaf community, which contributes to the improvement of services for them, including interpreters.

The Baghcheban manual alphabet has many variations due to the phonetic nature of the alphabet in the Iranian Deaf community. Learning the alphabet by touching parts of the body and feeling the vibrations, along with mouthing, and then making a dramatic shift to manualism resulted in visual adaptations. Signers preferred to modify the phonetic alphabet to an alphabetic system for ease of communication; that is why slight changes have occurred in the handshapes of nine manually created alphabet letters.

Variations are very much on the rise in Iran, and some are being adopted by a majority of signers due to the expanding number of Deaf societies, conferences, sports centers, social events, intermarriages, and Deaf awareness in general. As a result, the influence of geographical distance on variations was shown to be insignificant in this study. Variations embrace different ranges of gender, educational background, and age equally; those who have deaf families demonstrate a greater use of variations.

The adaptation of BMA toward a representation of the written forms of Persian, not of the phonetic system, has led to dissimilarity in similar shapes in the following groups: *p* /p/, *t* /t/, *k*/k/; s /s/, *š* /ʃ/ *f* /f/; *z* /z/, *j* /d͡ʒ/, *v* /v/; *Č* /t͡ʃ/ and ḥ /h/; ʿ /ʔ/ and ġ /ɣ/ or /ɢ/. These modifications have simplified the groups by changing their locations, handshapes, orientations, or movements.

As explained earlier, the naturally consistent pattern of variations makes the production of letters easier; these modifications include changing the location from contact with the body or face to the signing space. The handshapes also become more bent, crooked, loosely curved, or generally relaxed; the orientations change from facing forward to facing the body; the movements become larger and more distinctive. The purpose of the whole process is to smooth the progress of communication. Future studies need to determine whether additional variations lead to the differentiation of the remaining similar letters and to assess the impact of the modifications on the developing Deaf community in Iran.

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Notes

1. The Iranian Deaf Studies Foundation: www.idsf.ir/maghalat/226/499-1390-02-06-16-11-49.html and www.idsf.ir/maghalat/169/----166/318-history-sign-language-persian.html, both in Persian.

2. Julia Samii was the wife of Sirous Babak Samii.

3. This book was written by Jabbar Baghcheban and published two years before his death. In 1965 he gave an autographed copy of it to a woman whose son was deaf. He also created a written form of the book for deaf people.

4. "Signing space" means the space in front of the body (not touching the body) and usually toward the right side.

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