Research Article **Open Access**

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Sociolinguistic Variation in the Nativisation of BSL Fingerspelling

DOI 10.1515/opli-2017-0007
Received October 18, 2016; accepted March 16, 2017

Abstract: British Sign Language (BSL) is a visual-gestural language distinct from spoken languages used in the United Kingdom but in contact with them. One product of this contact is the use of fingerspelling to represent English words via their orthography. Fingerspelled loans can become "nativised", adapting manual production to conform more closely to the native lexicon's inventory of phonemic constraints. Much of the previous literature on fingerspelling has focused on one-handed systems but, unlike the majority of sign languages, BSL uses a two-handed manual alphabet. What is the nature of nativisation in BSL, and does it exhibit sociolinguistic variation? We apply a cross-linguistic model of nativisation to BSL Corpus conversation and narrative data (http://bslcorpusproject.org) obtained from 150 signers in 6 UK regions. Mixed effects modelling is employed to determine the influence of social factors. Results show that the participants' home region is the most significant factor, with London and Birmingham signers significantly favouring use of fully nativised fingerspelled forms. Non-nativised sequences are significantly favoured in signers of increasing age in Glasgow and Belfast. Gender and parental language background are not found to be significant factors in nativisation. The findings also suggest a form of reduction specific to London and Birmingham.

Keywords: British Sign Language; fingerspelling; sociolinguistic variation.

1 Introduction

British Sign Language (BSL) is the language of the British Deaf community. BSL is not "English on the hands": it is a different language in a visual-gestural modality and has its own phonology, morphology, syntax and semantics. Many Deaf users of BSL possess cultural and linguistic identities distinct from those of English speakers. Nonetheless, BSL has regular contact with English and can represent English orthography with its manual alphabet.

In spoken languages, uni-modal loan words (from one spoken language to another) are often adapted to the phonemic inventory of the borrowing language. In this section, we review previous proposals on how cross-modal loans (from a spoken/written language to a sign language) might undergo processes of phonological change or "nativisation", as well as the wider sociolinguistic context of BSL fingerspelling.

1.1 The BSL manual alphabet

Manual alphabets are not a direct representation of spoken language but a way of encoding orthography, the written form of a language (Brennan 2001). The act of fingerspelling consists of producing sequences of manual alphabet letters to represent complete words, abbreviations or initials. The manual representation

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of writing systems varies across different sign languages, even where the written language being represented is the same.

In BSL, the contemporary manual alphabet is a set of 26 "hand arrangements" (Sutton-Spence 1994) representing the modern Roman alphabet letters used in the written form of English. Phonological variants do exist, notably for the letters -b-, -c-, -m-, and -s- (Sutton-Spence 1994; Brennan 2001). But unlike the majority of the world's sign languages which use a one-handed fingerspelling system, BSL has a two-handed manual alphabet.[1] This has a number of consequences, discussed below.

1.2 Is fingerspelling "non-native"?

It has been questioned whether foreign language elements such as fingerspelling should be considered part of sign languages at all. Brentari and Padden (2001) characterise this as an "ideological anxiety": the Deaf community and sign linguists have worked hard to demonstrate that sign languages are not a code for spoken languages. The determination of what is and is not "native" BSL is therefore both a sociolinguistic issue (Sutton-Spence 1994) and a political one (Sutton-Spence & Woll 1999). Unlike native sign language vocabulary and syntax, the first manual alphabets were constructed by hearing educationalists: for some, fingerspelling may be uncomfortably related to the historical suppression of sign language in favour of English "oralism". However, use of fingerspelling in the Deaf community is diverse. It has been suggested that certain social groups (e.g. older people, Scottish people) might use fingerspelling more or less frequently (e.g. Sutton-Spence et al. 1990; Sutton-Spence 1994; Brennan 2001; Schembri & Johnston 2007). Register and conversational partners may also have a marked effect (Sutton-Spence 1994).

Whether the existence of English influences on BSL should be considered as peripheral to the native lexicon or not, the role that fingerspelling plays is important. Full fingerspelling is used to represent proper nouns from English and other concepts for which there may (or may not) be a lexical gap in the native lexicon. Furthermore, some fingerspelling forms have become part of the core BSL lexicon (Brennan 2001). Borrowing is normal for a living language: we might welcome this positively as yet further evidence that BSL meets that definition.

1.3 Nativisation versus lexicalisation

Brentari and Padden (2001) consider fingerspelled elements in American Sign Language (ASL) to be non-native in origin, yet they are nonetheless subject to many of the same phonological constraints as the native vocabulary. The phonological structure of loan elements can be altered in order to make them more "sign-like", a process known as nativisation. In both one- and two-handed systems, fluent fingerspellers are unlikely to produce a static, punctuated series of citation form letters: the transitions from one letter to the next will be "smoothed" so that handshapes and movement flow from letter to letter (Brennan 2001). With some words, letters might be deleted entirely. For ASL, Wilcox (1992) describes the pattern of movements in a fingerspelled word as a "movement envelope" and suggests that learning to fingerspell involves learning to coordinate the *transitions* between letters just as much as learning the hand configurations themselves. For BSL, the two hands move and change shape to facilitate contact between the hands and fingers. For example, with the fingerspelled vowels -a-, -e-, -i-, -o- and -u-, the selected finger on the non-dominant hand changes position to facilitate contact with the dominant hand (cf. the letters –a-, -o- and –u- in citation form in Figure 1 versus in fingerspelled -a-b-o-u-t- in Figure 20a below). Also, in many fingerspelled sequences, the handshape of the non-dominant hand depends on the letters that come before and/or after it, with assimilation processes across letters similar to assimilation found in sequential lexical signs in running discourse.

1 Two-handed systems are used in the BANZSL family (Johnston 2003), which includes BSL, Auslan (Australian Sign Language) and NZSL (New Zealand Sign Language), and also in Indo-Pakistani Sign Language (Zeshan 2000) and Turkish Sign Language (Tasci 2013).

Nativisation is therefore a restructuring process that moves a sequence of letters closer to conformity with the phonological constraints of native signs (Brentari & Padden 2001). In the current study, "nativisation" is considered distinct from "lexicalisation", i.e. the extent to which a production outside the core, native lexicon takes on a conventionalised form and meaning that is not fully predictable from its constituent parts and has become accepted as part of the language's vocabulary (Sutton-Spence 1994; Janzen 2012). The two concepts are inarguably related, as any loan word which becomes more lexicalised is also likely to become more nativised, and possibly vice versa. However, it is important to distinguish phonological restructuring from conventionalisation of form and meaning across a community of users. We emphasise this difference because the literature on fingerspelling occasionally uses the terms "lexicalised" (the extent to which a production has become conventionalised both in form and meaning across a community of users) and "nativised" (the extent to which a foreign loan has adapted to the phonological constraints of the host language) interchangeably (e.g. Brentari 1995; Brennan 2001; Brentari & Padden 2001).

1.4 Phonological constraints on native signs

Just as the phonemic inventories of different spoken languages will vary, different sign languages may have differing sets of "acceptable" phonological parameters. For example, there are handshapes in ASL that are not used in BSL. Brentari and Padden (2001) suggest that a sign's conformity to these inventories can be used to determine the degree of nativisation that a fingerspelled non-native loan has obtained.

Historically, researchers (e.g. Stokoe 1960; Battison 1978) have described four primary phonological parameters that differentiate signs from one another: handshape, movement, orientation and location. Much of the earlier literature focused on ASL, although research since then has shown that many of these hold for other sign languages as well. Well-formed signs appear to obey the following over-arching phonological constraints:

- Signs may be one-handed or two-handed. Two-handed signs are subject to the following constraints:
  - When both hands are moving, the Symmetry Condition (Battison 1978) specifies that both hands must have the same mirrored location, the same handshape, and the same movement (either simultaneous or alternating).
  - The Dominance Condition (Battison 1978) specifies that if they do not share the same handshape, then the non-dominant hand remains stationary and is "acted on" by the dominant hand.
- For both one-handed and two-handed monomorphemic signs, a number of "two-type" constraints apply. A sign can have at most:
  - two different movements (Sandler 1993; Brentari 1998);
  - two different locations (Sandler 1989);
  - two different handshapes, i.e. one handshape change (Sandler 1989).
- In monomorphemic signs, handshape changes can co-occur with movement (Brentari 1998) but if the movement contacts two different body locations then the handshape cannot change.

These phonological constraints can be applied to manual alphabet letters as well as signs. Languages with one-handed manual alphabets like ASL are typically specified only for handshape and orientation (and in a few cases also movement), as shown in Figure 2. Also, one-handed fingerspelling occurs in the space just in front of the dominant shoulder, different from lexical signs which are produced in various locations in the body or in "neutral" space centrally in front of the signer's chest. For BSL, the two-handed alphabet requires the hands to contact each other (in 25 out of 26 cases) and fingerspelling is typically articulated in the same "neutral" space where two-handed lexical signs are commonly produced. This entails that phonologically, BSL manual alphabet letters are fully specified for handshape and location (and in two cases, -h- and -j-, for movement), as shown in Figure 1. BSL fingerspelling therefore has an additional constraint on the potential phonological variation of spelling-related signs in comparison to one-handed systems like ASL. This does not mean that BSL fingerspelling's productivity for sign formation is necessarily more constrained, but that

BSL manual alphabet letters are arguably "more sign-like" from the very start: Brennan (2001:55) suggests that BSL fingerspelling might be "already more formationally integrated into the sign language than one-handed systems".

Figure 1: BSL fingerspelling system (from BSL SignBank; http://bslsignbank.ucl.ac.uk/spell/twohanded.html; Fenlon et al. 2014a)

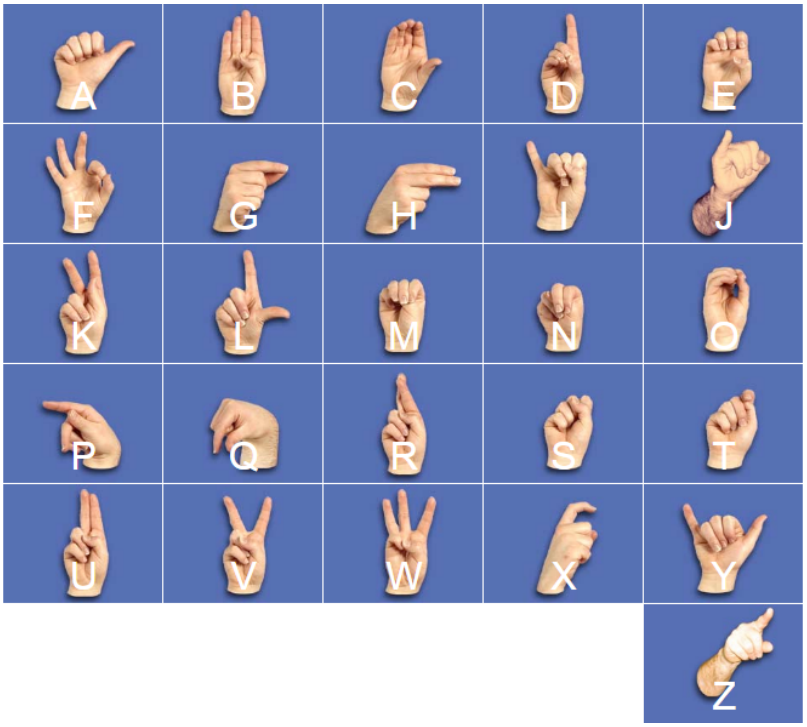

Figure 2: ASL fingerspelling system (from BSL SignBank; http://bslsignbank.ucl.ac.uk/spell/onehanded.html; Fenlon et al. 2014a)

1.5 Loans of one letter: initialisation versus SMLS

An immediate consequence of the additional phonological constraint on BSL manual alphabet letters is that the phenomenon of "initialisation" found in ASL (in which a sign is formed from the handshape of a manual alphabet letter but with added movement and location parameters) is by necessity less frequent in BSL. Instead we more frequently see the use of Single Manual Letter Signs (SMLS), which are also lexical signs formed from single letters but are considerably more limited in their variation of movement and location. Previous BSL research (e.g. Sutton-Spence 1994; Brennan 2001) occasionally treated initialised signs and SMLS as different manifestations of the same phenomenon. Here however, we view SMLS as phonologically distinct from initialisations.

The manual features of SMLS are often identical to a manual alphabet letter, possibly with repeated movement to contact between the two hands (referred to as "double articulation" by Sutton-Spence 1994). SMLS seem to be frequent in semantic categories such as family relationships (e.g. MOTHER, FATHER, DAUGHTER) and time/duration (e.g. MONTH, MINUTE, YEAR). Different signs formed from the same letter can be disambiguated by an accompanying English mouth pattern and/or from context. Figure 3 shows the SMLS signs MOTHER and DAUGHTER.

Figure 3: BSL MOTHER and DAUGHTER

Signs closer in nature to ASL initialisations are still possible in BSL, such as the verb RECOMMEND (the letter -r- moving between locations associated with indexed referents) and the number MILLION (an -m- making a short movement away from the body). There are others but these are not nearly as common as SMLS in BSL.

In ASL, Brentari and Padden (2001) observe that in addition to the phonological constraints listed above, for single letter initialisations the handshape parameter will have very limited scope for alteration, in order to preserve the manual alphabet letter's form. In contrast, it has been observed in BSL (Sutton-Spence 1994) that there are a few signs influenced by the manual alphabet which change the handshape or movement of the letter. Two such examples are DIGITAL and GOLD (see Figure 4), which start with a manual alphabet initialisation and then add a non-letter handshape change or a movement or both.

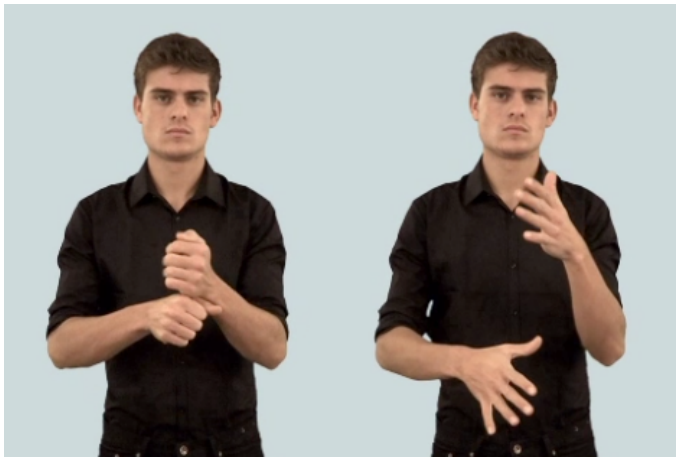

Figure 4: BSL GOLD

The lone exception to the constraints imposed by two-handed fingerspelling in BSL's (present day) alphabet is the letter -c-, which specifies only one hand and has no location or movement parameters specified. As a result, it is comparatively free from restrictions on movement, location and orientation and we see several examples of initialised signs that employ it with a variety of locations and movements, such as COMMUNITY, COURSE, and CONFIDENCE (see e.g. Figure 5). Sutton-Spence (1994) found that moving signs incorporating the letter -c- occurred more frequently than any other letter in her study.

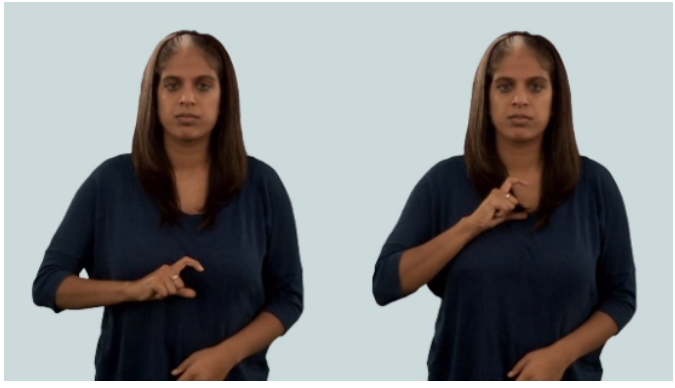

Figure 5: BSL CONFIDENCE

1.6 Loans of more than one letter

In ASL, there are some fully spelled English words (perhaps with some restructuring) that are broadly accepted and have been termed "loan signs" (Brentari & Padden 2001). Loan signs of this type appear to be less prevalent in BSL. Battison (1978) originally proposed in his seminal work on fingerspelling that lexicalised ASL fingerspellings formed from abbreviations are the result of a progressive restructuring, involving successive deletions of letters from a fully fingerspelled word. Such restructuring does not appear to occur in BSL in the same way. In her analysis of BSL fingerspelling, Sutton-Spence (1994) did not find any evidence of intermediate restructurings and suggested that for BSL, the majority of abbreviated fingerspelling loans are "created that way from the outset". Lexicalised abbreviations using two or more letters are not especially common in Sutton-Spence's data in comparison with SMLS and appear to favour

the first and last letters of a word (such as CLUB, or ABOUT) while non-lexicalised but at least partly nativised loans more frequently use the first two letters (-t-h- and -e-x- being notable, with the latter representing 7 different English words, including EXCUSE02 as in Figure 7). Non-lexicalised multi-letter borrowings can also be reflections of typical written English abbreviations (such as "doctor" to -d-r-, months of the year as -j-a-n-, -f-e-b- etc.). As always, there are exceptions, such as the lexicalised but only partly nativised two-letter sign PROJECT (Figure 6) and the multi-letter BIRMINGHAM02 (Figure 8).

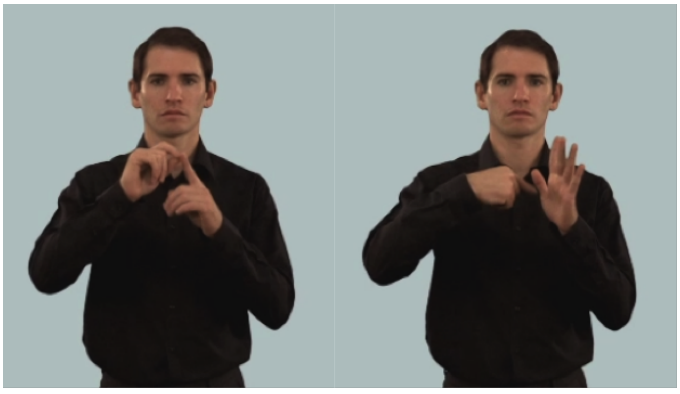

Figure 6: PROJECT

Figure 7: EXCUSE02

Figure 8: BIRMINGHAM02

Fingerspelled loans in BSL can also form part of a compound with a native lexical item (Sutton-Spence 1994). These often represent English loans which are themselves polymorphemic, such as -m-i-d-SPOUSE ("midwife") and -s-t-e-p-FATHER (the latter additionally interesting because FATHER is itself a lexicalised SMLS, -f-f-). A different type of compound loan uses an initial SMLS to represent a full English term compounded with a native lexical sign with a related meaning, in order to disambiguate the lexical sign: Sutton-Spence and Woll (1999) cite examples -g-LAND ("geography") and -c-LOOK-AFTER ("crèche") among others.

An important example of (partly) nativised but non-lexicalised fingerspelling usage is the creation of temporary formations employed during dialogue as a kind of "local lexicalisation" (Brentari 1995; Brentari & Padden 2001) – this may be better considered as local *nativisation* instead – as part of a drive for economy. In ASL, an English term might be fingerspelled in full the first time it is deployed and referred to successively with an extemporised reduction (Valli & Lucas 1992), by the signer(s) in that particular dialogue. There is however no established "go-to" lexicalised form for these loans in wide community use. In BSL, a "nonce" SMLS is more likely to be used as a form of local nativisation, formed from the first letter of the English term alone, perhaps with an accompanying English mouth pattern (Sutton-Spence 1994).

1.7 Models of non-native lexicon nativisation

We have established that a sign language may incorporate non-native loans from other sign languages and from spoken language written systems and that these loans may undergo nativisation. For ASL, Brentari and Padden (2001) proposed a model which divides the non-native lexicon into five overlapping categories, ranking the extent to which loans in ASL conform to the phonological constraints described above. Cormier et al. (2008) suggested that this model does not account for some patterns found in two-handed fingerspelling systems. In a one-handed system like ASL, handshape alone is usually enough to

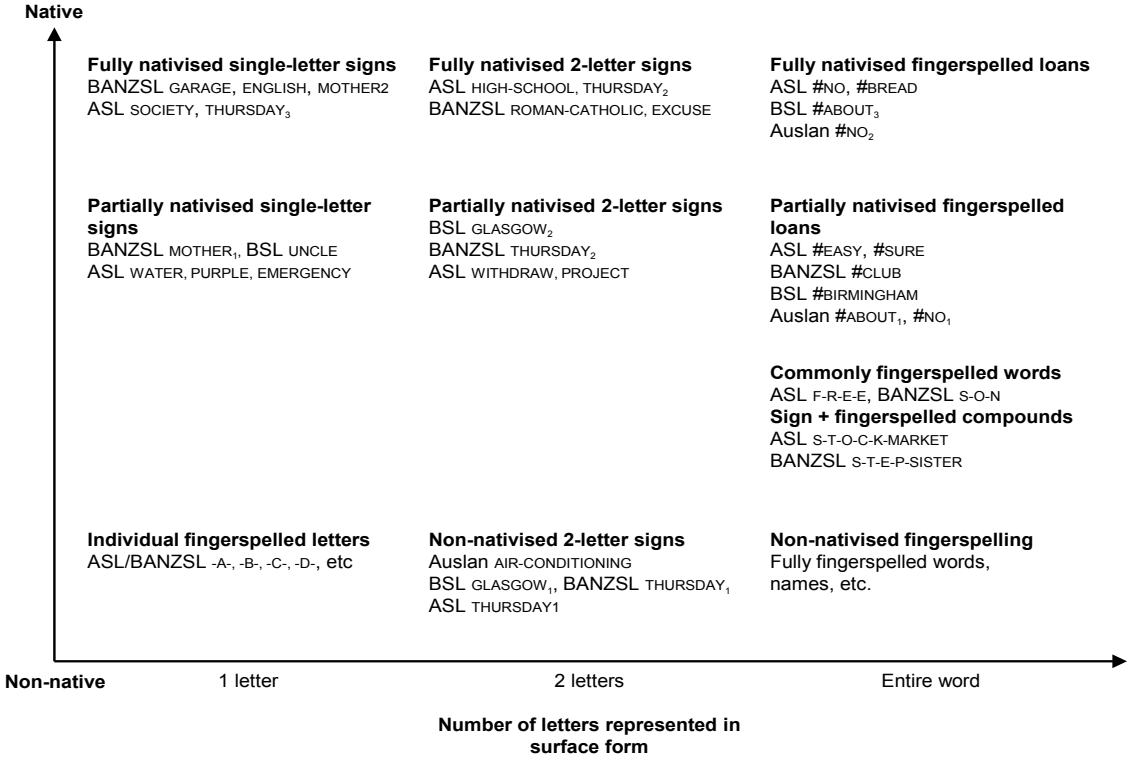

Figure 9: Working model of nativisation of fingerspelling in ASL and BANZSL (adapted from Cormier et al. 2008)

distinguish a manual alphabet letter, while in a two-handed system, a much smaller set of handshapes is used in different combinations with both hands – it is these combinations that uniquely identify letters, just as with lexical signs (and as noted above, most individual letters in BSL do fit the phonological structure of lexical signs). Furthermore, several ASL letters use handshapes which are not otherwise found in the native lexicon, while in BSL, only one variant of one manual alphabet handshape is not used by native signs (-m-).

Previously Cormier et al. (2008) presented a cross-linguistic working model of fingerspelling nativisation which describes the range of nativisation possible for fingerspelled loans with varying numbers of letters, across one-handed and two-handed systems (see Figure 9). This model was based on examples from the literature and from the authors' knowledge of the sign languages involved. The current study aims to apply this model of fingerspelling nativisation to spontaneous corpus data, and additionally to study the relationship between nativisation and sociolinguistic variation in BSL fingerspelling. Before we do this, we provide some background on the sociolinguistic context of sign languages and then previous studies of fingerspelling in the BANZSL family – i.e. BSL, Auslan (Australian Sign Language) and NZSL (New Zealand Sign Language) which all use the same two-handed manual alphabet.

1.8 The sociolinguistic context of sign languages

It has been widely recognised since the work of Stokoe (1960) that signed languages exhibit forms of sociolinguistic variation comparable to those found in spoken languages, and that these variations may be systematically linked to both social and linguistic factors (Bayley et al. 2015). However, it was not until the turn of the millennium that larger scale sign language studies were carried out which looked beyond lexical variation. Sign languages have since been shown to exhibit various processes of variation at the phonological, morphological, lexical and discourse levels.

Furthermore, while social factors such as region, age, ethnicity, gender, class etc. are typically relevant to studies of sociolinguistic variation in both spoken and signed language modalities, some social factors in sign language variation are likely to be particularly important (Schembri & Johnston 2012). Urban Deaf communities are typically small minorities embedded within much larger hearing/spoken language communities, surrounded by language use in spoken and written modalities; estimates of the current number of native BSL users (or those who use it as their preferred form of communication) vary between 30,000 and 250,000 within a general population of over 60 million. Linguistic outcomes of this contact situation such as fingerspelling and mouthing are unique to bimodal, bilingual communities (Valli & Lucas 1992).

In the UK, industrialisation and mass migration to urban centres contributed to the establishment of schools for deaf children beginning in the late 18th century, with 22 schools established by 1870 around the country, creating regional focuses for BSL variation and transmission to following generations of signers (Schembri et al. 2010). However, at the Congress of Milan in 1880, the majority of European educators called for a ban on the use of sign languages in the classroom in favour of oral methods intended to reinforce speaking, lip-reading and writing, although children's use of sign language persisted outside of the classroom. Fingerspelling (with its strong connection to English orthography) was often viewed as an acceptable way of teaching and reinforcing English spelling. It was therefore less likely to be covered by the sign language ban (depending on local policy), and continued to be used for this purpose in many deaf schools through the early-mid 20th century, influencing the communicative preferences of those generations. By the 1980s, many of the residential deaf schools had closed and were replaced with "mainstreaming" education practices, with deaf children being integrated into classes of hearing children or attending a specialist unit attached to a school. Some mid-late 20th century schools promoted manually encoded forms of English such as Signed Exact English or Sign Supported English, which may use some of the BSL lexicon accompanied by English mouth patterns but abandon BSL's syntax in favour of English word order – but the specific use of fingerspelling as an "oralist" teaching tool in these educational settings declined (Sutton-Spence et al. 1990). In the 21st century, many UK schools for the deaf now favour a "total communication" approach, which emphasises a mix of communication strategies (e.g. speech, signed English, BSL and fingerspelling, lip-reading, symbolic/visual communication aids) tailored to the needs of individual pupils.

Education policy and actual practice in schools has thus varied over time and place, with different local and regional authorities having final responsibility, suggesting that age and region in combination are likely to be predictors of variation, particularly when it comes to language contact features such as fingerspelling.

1.9 Previous analyses of BANZSL fingerspelling

Sutton-Spence (1994) conducted a comprehensive analysis of fingerspelling influences on BSL production as a doctoral thesis, using a dataset of BSL derived from the long-running BBC television programme *See Hear!* as well as data from elicitation tasks, with some key results already referred to above. Nativisation extent and the usage of more nativised forms was analysed, but not explicitly in terms of an over-arching model of nativisation. It was suggested that older signers tend to fingerspell more, particularly if they are also Scottish, Welsh or Irish: this was attributed to changes over time in regional education methods but also to family language background (i.e. whether or not their families were deaf). Findings from this same *See Hear!* dataset were additionally reported in Sutton-Spence, Woll and Allsop (1990), but with a different regional breakdown to the current study.

McKee and Kennedy (2006) used the Wellington Corpus of NZSL to analyse the lexical frequency of signs, including fingerspelled items. 2.5% of the 100,000 tokens analysed had a fingerspelled component. It was observed that 46.8% of the fingerspelling tokens were "initialised", defined as "only the first letter fingerspelled" (i.e. no distinction was made between an initialisation and an SMLS). In a separate sociolinguistic study, McKee and McKee (2011) observed that older signers of NZSL made minimal use of the manual alphabet.

Schembri and Johnston (2007) conducted a pilot study employing a mixed effects analysis of fingerspelling use in a corpus of Auslan. The study did not have a particular focus on nativisation, but did investigate the variance of non-lexicalised fingerspelling across social factors: interactions with age, gender, region, social class and language background (deaf or hearing family) were analysed. Schembri and Johnston concluded that increasing age was the most significant social predictor for increased use of fingerspelling in Auslan. Region was also found to have a significant effect, though the participants were divided into just two regional groups and the impact of the effect was mild. Gender, social class and language background were not found to be significant. It is noted that the software used (GoldVarb X) has since been replaced with a more robust alternative (Rbrul) which is less prone to Type I errors: individual speakers should properly be treated as a random effect, and for a conservative approach in mixed effects modelling the Bonferroni correction should be applied to significance thresholds (Johnson 2009).

The BSL Corpus is relatively new and there has been no previous in-depth study of manual alphabet use within it, although non-nativised fingerspelling was found to occur 3.0% of the time within 25,000 tokens of manual productions from conversation data from two regions (Bristol and Birmingham) including gestures, pointing, classifiers and constructed action as well as lexical signs (Fenlon et al. 2014b).

1.10 Research questions

It is clear that fingerspelling can undergo nativisation in order to more closely resemble signs in the native lexicon. Studies have also suggested that non-nativised fingerspelling is employed more frequently by specific sections of the community. This study sets out to address the following questions:

- How frequently are nativised and non-nativised forms of fingerspelling employed by BSL signers?
- What is the extent of nativisation of one-letter, two-letter and multi-letter formations in BSL?
- Do social factors such as age, region, gender and language background correlate with fingerspelling use, in terms of the relative frequencies of nativised and non-nativised forms?

– For more nativised forms, how is fingerspelling altered to conform to the general phonological constraints on sign formation?

To address these questions, we study fingerspelling in the BSL Corpus.

2 Method

2.1 Selection of participants, social factors and tasks

Participants for the original data collection stage of the BSL Corpus (2008-2011) were recruited from eight UK cities with the aim of creating a representative sample in terms of age, gender, ethnicity, region and language background, despite some difficulties in defining what a representative sample of the Deaf community might look like (Schembri et al. 2013). A quota system was employed with recruitment of participants from specific social factor groups halting when the quota had been reached. The data collection phase was completed in 2010 and the annotation phase is (at the time of writing) ongoing. To date, 55,000 sign tokens have been annotated and made available online (http://www.bslcorpusproject.org); additionally, these annotations have been used to produce an online corpus-based dictionary, BSL SignBank (Fenlon et al. 2014a).

For this study, we focus on data collected from the conversational and personal narrative components of the BSL Corpus. Specifically, we focus on a subsection of the BSL Corpus conversation data: 101 signers from 4 cities in the UK (Birmingham, Bristol, London, and Manchester). We also include a subsection of the BSL Corpus narrative data: 49 signers from 2 UK cities (Glasgow and Belfast). A sample of 100 signs from each of the conversation and narrative files was annotated using ID glosses as described above, resulting in a set of 15,000 signs. In Table 1, the distribution of participants according to several social categories is provided, including region, gender, age, and language background (i.e. whether signers are from a deaf or hearing family).

Table 1: Distribution of participants according to social categories

Region	Gender		Age				Language background		Total
	Male	*Female*	*16-30*	*30-45*	*45-60*	*60+*	*Deaf*	*Hearing*	
Belfast	12	13	7	4	9	5	6	19	**25**
Birmingham	16	10	3	11	5	7	12	14	**26**
Bristol	12	12	3	6	8	7	16	8	**24**
Glasgow	12	12	5	7	5	7	6	18	**24**
London	13	12	3	8	9	5	13	12	**25**
Manchester	12	11	4	5	5	9	9	14	**23**
Total	**77**	**70**	**25**	**41**	**41**	**40**	**62**	**85**	**147**

Consideration was given to whether the situational variety of the two different tasks (i.e. conversation and personal narrative) were directly comparable. It was noted that for all participants, the conversation and narrative tasks were filmed in the same session with the same conversational partners, who knew each other but were not too close (Schembri et al. 2013). The narratives are therefore not context-free monologues: they retain elements of conversational interaction such as accommodation, back-channelling, and requests for clarification (both explicit and implicit). Conversely, for the conversation tasks, it would reasonably be expected that no dialogue will ever be perfectly balanced between participants or require brief conversational turns: conversations are likely to involve some personal narrative. It was therefore felt that the setting of the two tasks were sufficiently comparable for the purposes of this study.

Region has been found to be important in previous studies of BSL fingerspelling (e.g. Sutton-Spence et al. 1990; Sutton-Spence 1994). In terms of location (city/region) in the BSL Corpus, participants who had been lifelong residents of that region were preferred at recruitment, with living or working in that area for the previous 10 years being the minimum requirement. Age has also been found important for fingerspelling – e.g. Sutton-Spence (1994) found that older signers tend to fingerspell more. Since few signers are born to signing parents[2], large centralised deaf schools appear to have played a primary role in transmitting the language from generation to generation. Variation in educational policy within such schools therefore has the potential to impact upon patterns of use. Recruitment to the BSL Corpus Project was designed to reflect this variation by ensuring that participant selection was evenly spread across four age groups (ranging from 16 to 94 years of age). The division of participants into these age groups was partly motivated by changes in language policy in deaf education during the 20th century (e.g. from education that emphasised the exclusive acquisition of speech and listening skills to increasing acceptance of sign language in the classroom and more recently a shift away from specialist schools for the deaf to units or provision in mainstream schools; see Woll & Ladd 2011 for an overview).

In terms of language background, nearly half (42%, n = 62) were native signers (i.e. they had at least one signing parent who was deaf). Of the remaining number (58%, n = 85), 79 reported having learned to sign before the age of 7, 5 reported having learned to sign between the ages of 8-12, and 1 reported having learned to sign between the ages of 13-18. Research has demonstrated that the age of sign language exposure has a considerable effect on sign language proficiency generally in adulthood (Emmorey 2002; Mayberry 2010), and it has been observed that children who are native signers frequently learn to fingerspell before they learn to read (Sutton-Spence 1994). Therefore, we might expect to see variation in fingerspelling reflecting a signer's age of BSL acquisition.

Our participants were balanced for gender overall. Gender is also a relevant factor in language change. Studies based on spoken and signed language communities have indicated that women often lead processes of language change (e.g. Rickford et al. 1995; Schembri et al. 2009).

Examining the ethnicity data for the corpus participants as a whole, 91% identify as White with the remaining 9% (just 22 individuals) split between the various Black, Asian and Other top level groups. While this is not radically different to the proportions of ethnic labels found across the UK (Office for National Statistics 2013), analyses of interactions with such small factor groups are unlikely to be reliable, particularly when only six of the eight corpus regions are being sampled. Ethnicity was therefore not selected for analysis.

Participant education level and social class data were available and considered for analysis but had to be excluded. The latter was partly derived from the former; both factors also lack independence from age and region due to historical/local changes in deaf education methods and equality legislation. Mixed effects modelling requires full independence of factors.

2.2 Coding

The working model proposed by Cormier et al. (2008) as in Figure 9 has the number of letters and extent of nativisation as continuous axes. For coding purposes for the current study, a discrete nativisation scale of N1, N2 and N3 was devised, corresponding respectively to the model's definitions of non-, partly- and fully-nativised fingerspelling based on conformity with the phonological constraints described in §1.4 above. The number of letters in a sequence was represented as L1 (one letter), L2 (two letters) and L3 (three or more letters). This system produced an annotation code in the form L*n*N*m*, with *n* and *m* having a value of 1-3, producing a 3x3 grid of nine annotation codes. A description of the typical tokens the codes were applied to is found in Table 2; for examples, see Figures 3-9.

2 The number of native signers in the UK is unknown, but it is largely thought that roughly 5-10% of deaf people are born into signing families, following similar proportions documented in other countries (Mitchell & Karchmer 2004).

To locate all instances of fingerspelling in the Corpus sample, two different general classes of existing gloss annotations had to be considered: (1) "non-nativised" fingerspelling, annotated as such using the FS: fingerspelling prefix according to the BSL Corpus annotation guidelines (http://bslcorpusproject.org/cava), and (2) partly- or fully-nativised signs related to the manual alphabet, each with their own unique ID gloss referring to a citation form listed in the BSL SignBank lexical database. BSL SignBank is a free online dictionary and lexical database of BSL (http://bslsignbank.ucl.ac.uk), the first online BSL resource to be both research-based and usage-based. BSL SignBank also functions as the lexical database reference source for annotations in the BSL Corpus: every SignBank entry consists of a video showing the sign in citation form, a set of English translation equivalents, an "ID gloss" (a unique alphanumeric code usually related to one of the English translation equivalents), as well as a number of searchable properties describing the phonology and other linguistic features.

Table 2: Description of the typical "type" of token described by each L-N- annotation code

N3 (fully nativised)	SMLS or initialisation which violates no phonological constraint, e.g. DAUGHTER	A two-letter "sign" that violates no phonological constraint, e.g. EXCUSE02	None (a 3+ letter sequence always violates a phonological constraint)
N2 (partially nativised)	SMLS-like sign which violates a constraint or uses a handshape not found in the native lexicon, e.g. MOTHER with 3-fingered handshape	A two-letter "sign" that does not fully meet phonological constraints, representing a longer word, name or phrase, e.g. PROJECT, TELEVISION	Sequence of 3 or more letters which represent an abbreviated word or which smooths fingerspelling phonology, e.g. BIRMINGHAM02, -d-a-y-
N1 (non-nativised)	Literal intended representation of a single letter, e.g. -m-ONE for the M1 motorway	Literal intended representation of a two-letter word, eg. -s-o-, -b-y-	Literal, (near-)exact representation of a 3+ letter word
	L1 (1 letter)	**L2 (2 letters)**	**L3 (3 or more letters)**

All published SignBank entries were systematically inspected by the first author and two Deaf native signers of BSL. Each sign identified as derivable from BSL fingerspelling was assigned a unique tag ("lexis:fingerspell"), allowing these signs to be searched for and exported. A sign was deemed to be a candidate if the sign clearly began or ended with a hand arrangement that resembled a BSL manual alphabet letter corresponding to a letter in an English translation equivalent of that sign (usually the first letter). This definition was intended to exclude handshapes which iconically resemble written orthography in some way but do not resemble a BSL manual alphabet letter (for example, signs such as LIVERPOOL which employ a handshape depicting a written capital L – identical to the one-handed ASL letter -l- shown in Figure 2) or borrowed signs incorporating fingerspelling systems from foreign sign languages (for example the sign NO02 which is likely a loan from ASL).

This process produced 133 lexical items which were tagged as having a fingerspelling component from the 2,362 in the public BSL SignBank database at that time. Each of the citation forms was then given an L*n*N*n* annotation code from the coding scheme above.

The corpus sample of 15,000 tokens (150 participants, 100 tokens each) was then searched for each of these 133 ID glosses. Once located, an annotation was created on a new tier with the appropriate annotation code for that *specific* instance of the sign. Additionally, a suffix was used to indicate whether each token was more (+), less (-) or equally nativised (=) in comparison to the SignBank citation form.

Following this, all non-lexicalised fingerspellings (annotated in the BSL Corpus with the tag "FS:") were searched for, inspected and coded. SMLS-like signs consisting of a repeated letter, for example FS:N-NOTTINGHAM (-n-n-) or the nativised sign MOTHER (-m-m-), were treated as just one letter, in line with the Corpus fingerspelling annotation conventions (Cormier et al. 2015). Fingerspelling annotations embedded in possible compounds, e.g. FS:MID^SPOUSE ("midwife"), were also included, as well as those embedded within "SN:" sign name[3] annotations. In all cases, glosses denoting any uncertainty, ambiguity, hesitancy,

3 Sign names identify persons, places and brands. They can be derived from a range of sources including the BSL native lexicon, the manual alphabet (with or without phonological variation) and descriptive signs (Sutton-Spence & Woll 1999).

or provisional status were excluded (e.g. UNKNOWN, INDECIPHERABLE, FALSE-START).

On completion, a consistency check was arranged: a random sample of 20% of the tokens was cross-checked by a hearing BSL signer with sign linguistics training who was provided with the coding scheme and instructions above, with no cases of disagreement.

2.3 Statistical analysis

Rbrul (Johnson 2009) was selected to perform analysis, as it has a number of advantages: it was designed specifically with linguistic analysis in mind and is more robust for relatively small data sets than predecessors such as GoldVarb. Before analysis began, we noted that 3 of the 150 participants did not produce any fingerspelling-related tokens of any type. These participants were excluded from analysis as recommended by Guy (1988) and Johnson (2010), leaving 147. This data set, with 931 tokens from 147 participants, was deemed to be within Rbrul's tolerance for sample size and tokens-per-participant as suggested by its documentation (Johnson 2010).

The dependent variables in question (nativisation extent and number of letters) were coded for with three-value codes (N1, L3, etc.) creating a set of nine discrete values (L1N1, L1N2 etc.). As logistic regression requires a binary value for analysis, three tests were planned using appropriate groupings of values: firstly, non-nativised against partly- and fully-nativised usage (N1 v N2+N3); secondly, fully nativised versus partly- or non-nativised usage (N3 v N1+N2); and finally SMLSs, the most common type, versus all other codes (L1 v L2+L3). We planned for all three tests as there was no clear theoretical, statistical or practical motivation for preferring any of these particular two-way splits over another. Furthermore, these three perspectives enabled a more nuanced picture of variation in manual alphabet use in the event that any differences might arise in the interactions between these differing groups of codes.

Age was treated as a continuous variable and centred on the mean to avoid tolerance issues (uncentred continuous ranges can cause modelling difficulties, e.g. when calculating the standard deviations of fixed effects). Gender and language background were treated as binary values, region as a category with six values.

Descriptive statistics of the data were prepared, and cross-tabulations of pairs of social factors were first visually inspected for obvious patterns. Mixed effects variable rule modelling with stepwise regression was then performed with all four social factors to establish any interactions between them.

3 Results

3.1 Descriptive statistics

3.1.1 All tokens

The 147 participants produced 931 fingerspelling-related tokens within the 14,700 sign tokens in the corpus sample (6.3%). Of this 6.3%, 3.4% were non-lexicalised "FS:" fingerspelling annotations (including possible compounds and sign names) which were at least partly nativised or non-nativised while 2.9% were lexicalised fingerspelling-related signs from BSL SignBank. Figure 10 shows a breakdown of the 931 tokens between non-lexicalised "FS:" fingerspelling annotations (including possible compounds and sign names) which were at least partly nativised (26.5%) and non-nativised (28.2%) versus lexicalised fingerspelling-related signs from BSL SignBank (45.2%).

Table 3 shows the distribution of the 931 tokens across the Cormier et al. (2008) nativisation model represented by the coding categories described in §2.2. Around half of the tokens were fully nativised, with the other half being either partially or non-nativised. SMLS (category L1N3) accounted for over 44% of the tokens, with non-nativised multiple letter fingerspelling sequences (L3N1) taking up nearly

23%. No fully nativised (i.e. fully constraint-conforming) sequences of 3 or more letters (L3N3) were identified.

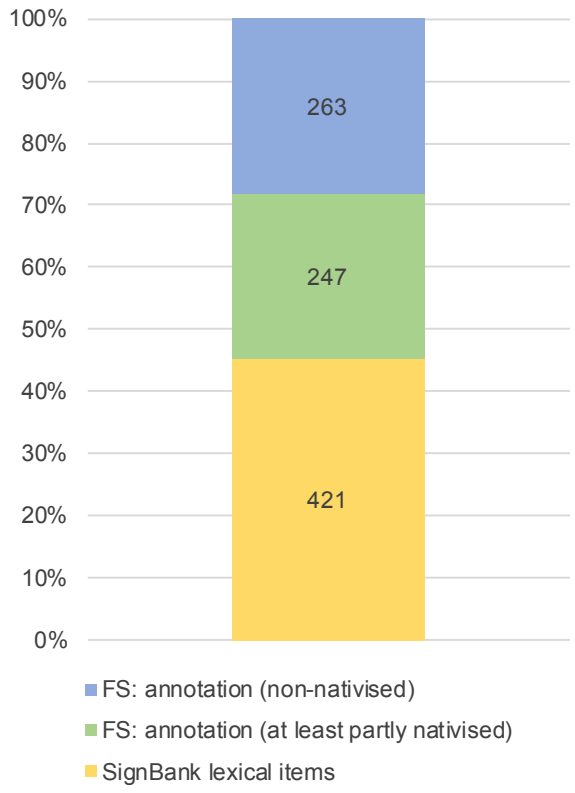

Figure 10: Breakdown of 931 fingerspelling tokens by annotation type

Table 3: Distribution of fingerspelling-related tokens by number of letters (L) and nativisation (N)

	L1	L2	L3	Total
N3	412 (44.3%)	48 (5.2%)	0 (0.0%)	**460 (49.4%)**
N2	78 (8.4%)	82 (8.8%)	48 (5.2%)	**208 (22.3%)**
N1	11 (1.2%)	41 (4.4%)	211 (22.7%)	**263 (28.2%)**
Total	**501 (53.8%)**	**171 (18.4%)**	**259 (27.8%)**	**931 (100%)**

3.1.2 Region

Table 4, Figure 11 and Figure 12 show the distribution of tokens across the Cormier et al. (2008) nativisation model by region. Table 4 shows that while Bristol signers appear at first glance to have produced the most tokens, especially in the non-nativised multi-letter category (L3N1), on closer examination this was due in large part to the outlying production of just two participants, who were the first and fifth most productive fingerspellers in the entire sample and also two of the three participants aged 85-90. Glasgow and Belfast signers also produced a high number of L3N1 tokens. Figure 11 shows that signers in London and Birmingham produced more N3, fully nativised signs while signers in Belfast and Glasgow produced more N1, non-nativised signs. Figure 12 shows that Belfast and Glasgow have the smallest proportions of single-letter signs while London and Birmingham have the highest.

Table 4: Distribution of fingerspelling-related tokens across nativisation model per region

	Belfast (n=25)	Birmingham (n=26)	Bristol (n=24)	Glasgow (n=24)	London (n=25)	Manchester (n=23)
L1N1	4	1	3	2	1	0
L1N2	12	9	25	9	14	9
L1N3	60	75	85	43	98	51
L2N1	10	2	7	14	2	6
L2N2	17	17	8	12	11	17
L2N3	6	5	7	6	4	20
L3N1	48	14	56	46	16	31
L3N2	9	5	9	5	10	10
L3N3	0	0	0	0	0	0
Total	**166**	**128**	**200**	**137**	**156**	**144**

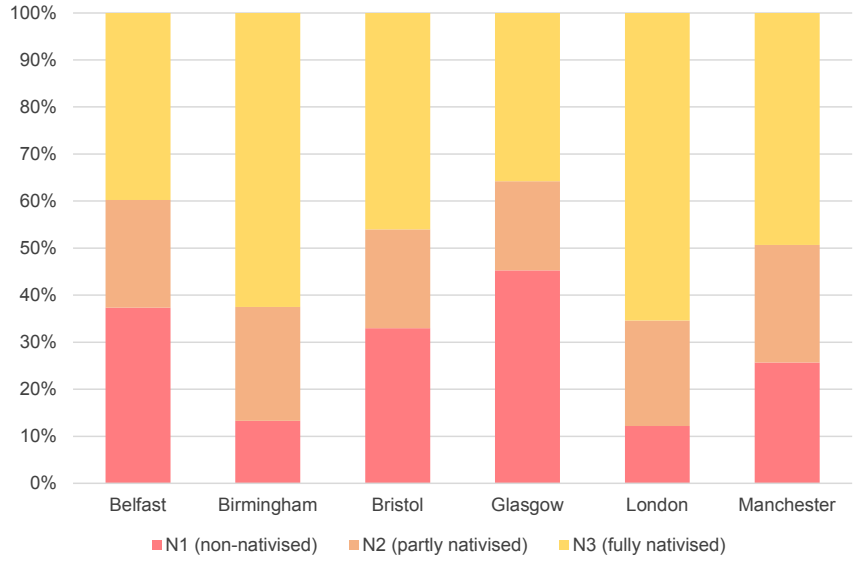

Figure 11: Distribution of fingerspelling-related tokens across nativisation model (N only) per region

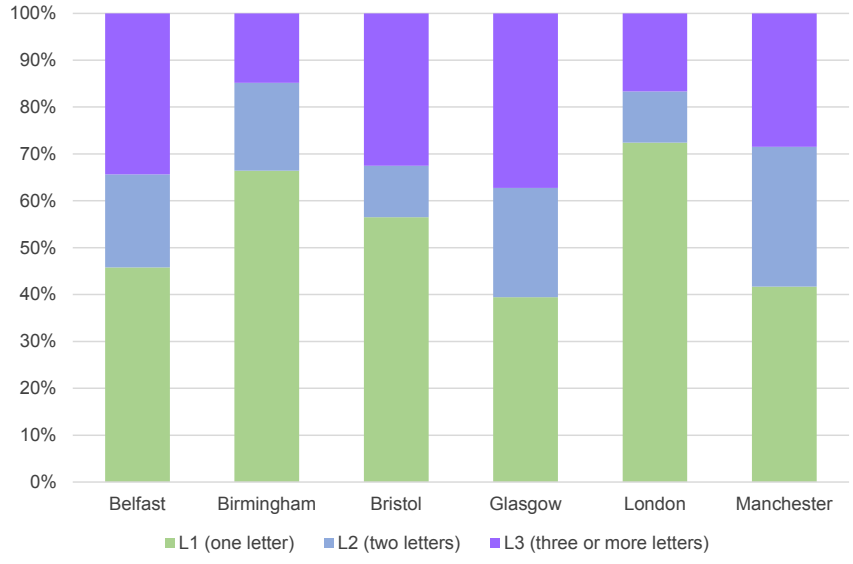

Figure 12: Distribution of fingerspelling-related tokens across nativisation model (L only) per region

3.1.3 Age

Table 5 shows the frequencies of fingerspelling-related tokens per age band, showing the counts of non- and partly/fully-nativised tokens and the mean number of tokens per participant. Figure 13 displays this data as a histogram, suggesting at first glance that non-nativised fingerspelling production appears to increase from age 60 and above, while nativised fingerspelling production does not display such clear variation related to age. Figure 14 and Figure 15 depict the proportions of L and N codes per age band, indicating a possible trend for an increase in non-nativised fingerspelling with increasing age and a clear preference for multi-letter fingerspelling over age 75. Overall, then, we see that increasing age means more use of non-nativised fingerspelling, including full fingerspelling, particularly in the oldest group. It should be noted however that the 75-90 group is under-represented.

Table 5: Distribution of fingerspelling-related tokens by age band

Age bracket	Number of participants (total 147)	Number of tokens (total 931)	N1 tokens (non-nativised)	N2+N3 tokens (partly/fully nativised)
15-30	25	167	34	133
30-45	41	258	42	216
45-60	41	218	59	159
60-75	30	180	61	119
75-90	10	108	67	41

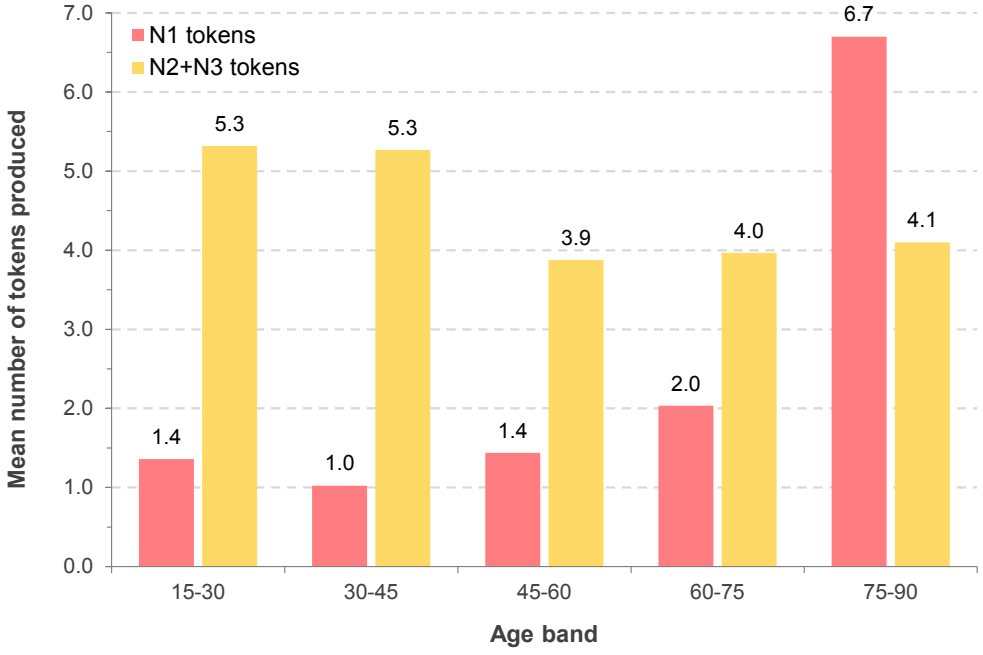

Figure 13: Mean number of N1 and N2+N3 tokens produced per participant in each age band

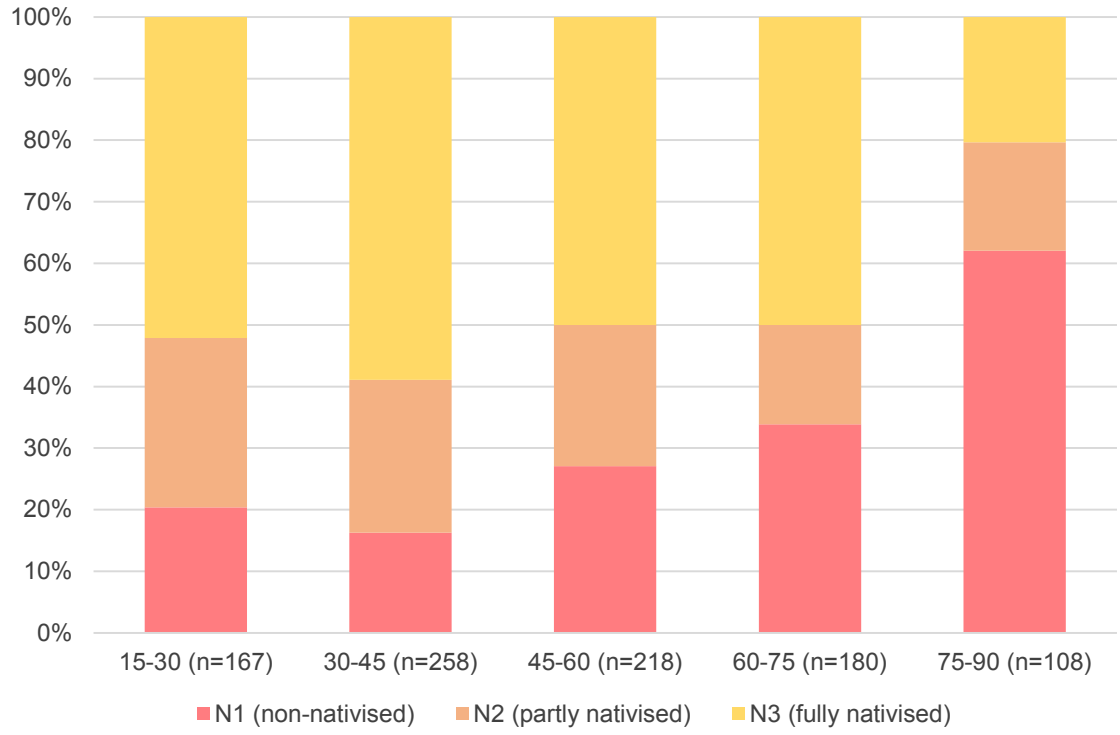

Figure 14: Distribution of fingerspelling-related tokens by nativisation category (N only) and age bracket

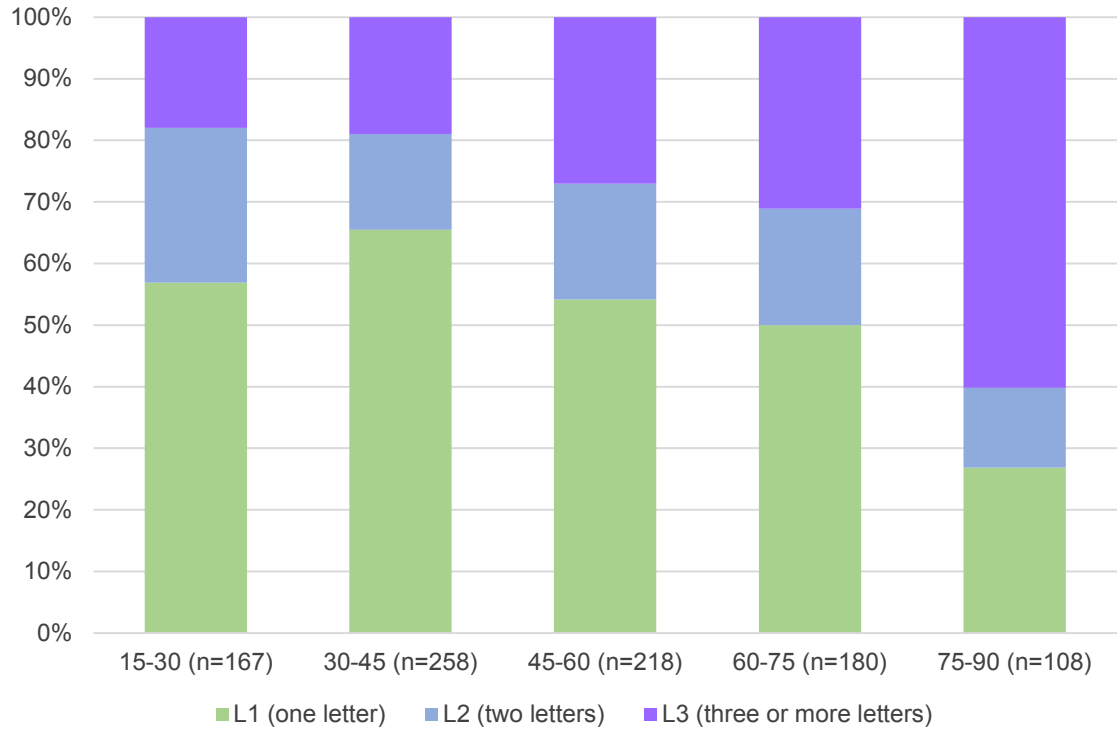

Figure 15: Distribution of fingerspelling-related tokens by nativisation category (L only) and age bracket

3.1.4 Gender

Figure 16 and Figure 17 break down the fingerspelling tokens across the nativisation model by gender. The percentage of tokens per nativisation category does not appear at first glance to vary substantially by gender.

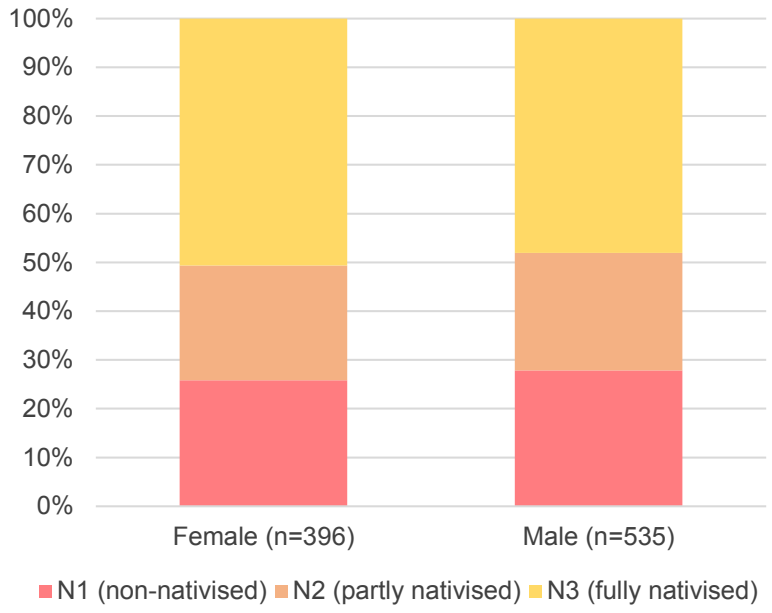

Figure 16: Distribution of fingerspelling-related tokens by nativisation category (N only) and gender

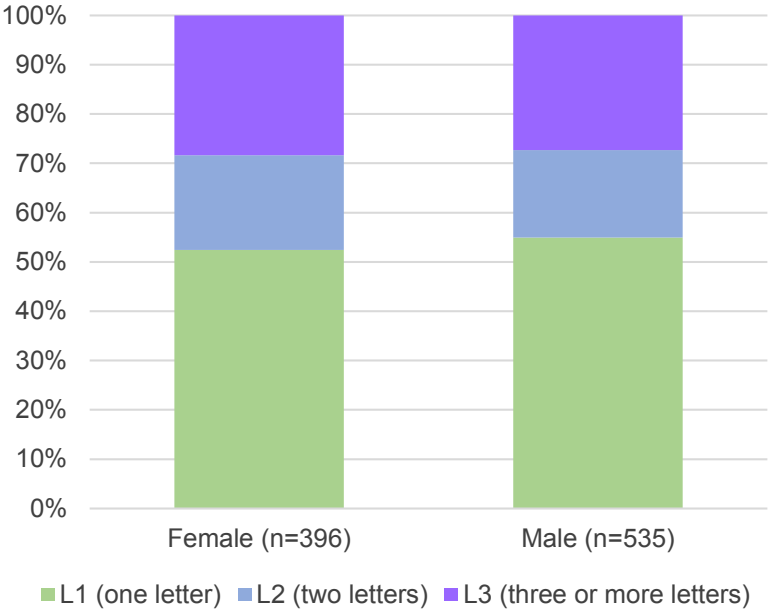

Figure 17: Distribution of fingerspelling-related tokens by nativisation category (L only) and gender

3.1.5 Language background

Figure 18 and Figure 19 break down the tokens produced per annotation category by language background (i.e. participants with Deaf native BSL-using family members, or not). From a visual inspection alone there appears to be a small variation between backgrounds across the categories, particularly N1 and N3.

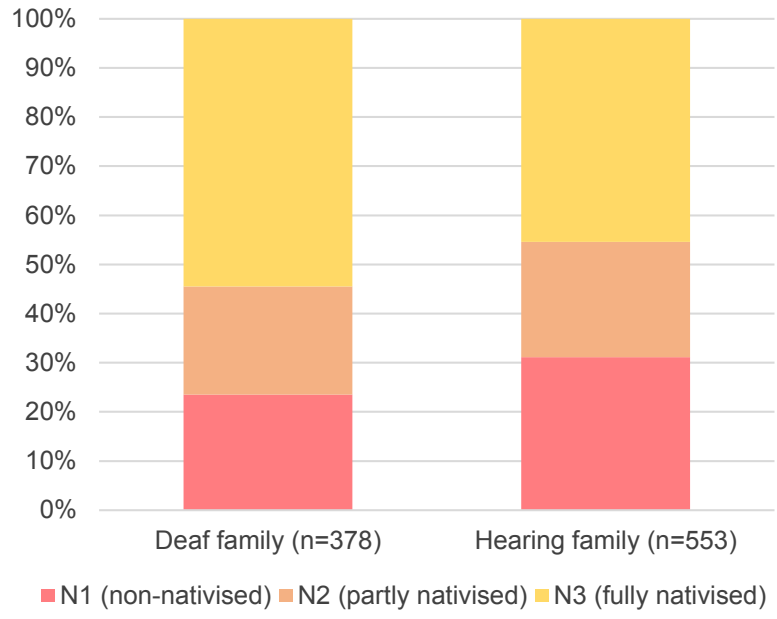

Figure 18: Distribution of fingerspelling-related tokens by nativisation category (N only) and by family language background

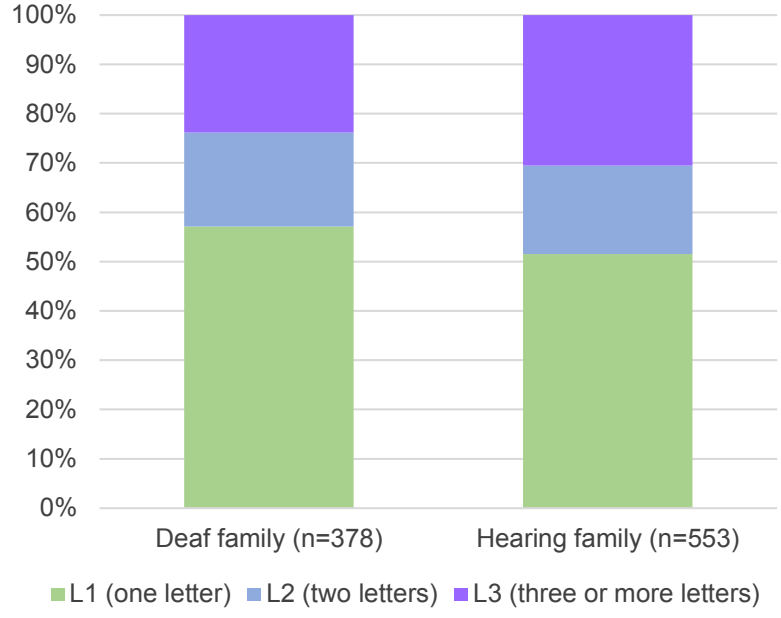

Figure 19: Distribution of fingerspelling-related tokens by nativisation category (L only) and by family language background

3.2 Mixed effects variable rule analysis

3.2.1 Non-nativised tokens (N1) versus partly or fully nativised (N2+N3)

For the first analysis, we compared least nativised tokens (N1) with partly or fully nativised tokens (N2+N3). All possible interactions between region, age, gender and language background were modelled with stepwise regression (see Table 6), with participants treated as a random effect and age as a centred continuous variable. The best model was increasing age ($p<0.001$) + region ($p<0.001$) with none of the other factors making a significant contribution when region and age were included. Older participants in Glasgow and Belfast had a reasonably similar increased likelihood of using non-nativised forms of fingerspelling; those in Bristol and Manchester both fell close to the mean thus not particularly favouring or disfavouring non-nativised forms of fingerspelling; those in Birmingham and London showed a similarly decreased likelihood of using non-nativised forms of fingerspelling. The magnitude of the effect of region was moderate (minimum to maximum factor weights of 0.312 to 0.703). The magnitude of the effect of age was fairly mild, suggesting an increased likelihood of using non-nativised forms (N1) at a logodds of 0.028 per additional year of age. There was considerable variation between individuals, with only 33% of the variation accounted for by the best fit (coefficient of determination $R^2 = 0.332$).

Table 6: Mixed effects variable rule analysis of N1 v N2+N3, interaction with region

Region	Token count	Logodds	Proportion N1/N2+N3	Centred factor weight
Glasgow	137	0.863	0.453	0.703
Belfast	166	0.719	0.373	0.672
Bristol	200	0.020	0.330	0.505
Manchester	144	-0.060	0.257	0.485
Birmingham	128	-0.753	0.133	0.320
London	156	-0.789	0.122	0.312

3.2.2 Fully nativised tokens (N3) versus non- or partly-nativised (N1+N2)

For the second analysis, we compared the most nativised tokens (N3) with non- or partly nativised tokens (N1+N2). All possible interactions between region, age, gender and language background were modelled with stepwise regression (see Table 7), with participants treated as a random effect and age as a centred continuous variable. The best model was simply region ($p<0.01$) with none of the other factors making a significant contribution to the model when region was included. London and Birmingham participants slightly favoured the production of nativised forms of fingerspelling-related signs; Manchester and Bristol fell more closely to the centred weight of 0.5 thus neither particularly favouring or disfavouring use of nativised forms of fingerspelling-related signs; Belfast and Glasgow showed some disfavour for using nativised forms of fingerspelling. The magnitude of the effect was mild to moderate (minimum to maximum centred factor weights of 0.346 to 0.643) but there was considerable variation between individuals, with only 27% of the variation accounted for by the best fit (coefficient of determination $R^2 = 0.269$).

Table 7: Mixed effects variable rule analysis of N3 v N1+N2, interaction with region

Region	Token count	Logodds	Proportion N3/N1+N2	Centred factor weight
London	156	0.586	0.654	0.643
Birmingham	128	0.586	0.625	0.642
Manchester	144	0.078	0.493	0.519
Bristol	200	-0.051	0.460	0.487
Belfast	166	-0.563	0.398	0.363
Glasgow	137	-0.636	0.358	0.346

3.2.3 SMLS and initialised signs (L1) versus multiple letter forms (L2+L3)

For the third analysis, we compared SMLS and initialised signs (L1) with forms consisting of two or more letters (L2+L3). All possible interactions between region, age, gender and language background were modelled with stepwise regression (see Table 8), with participants as a random effect and age as a centred continuous variable. The best model was simply region ($p<0.001$) with none of the other factors making a significant contribution. Participants in London and to a lesser extent Birmingham show a preference for SMLS and initialised signs over other forms of fingerspelling; Bristol only very slightly favours them; Manchester, Belfast and Glasgow show some disfavour for SMLS and initialised signs over other forms of fingerspelling. The magnitude of the effect is moderate (minimum to maximum centred factor weights of 0.332 to 0.716) but there is considerable variation between individuals, with only 32% of the variation accounted for by the best fit (coefficient of determination $R^2 = 0.32$).

Table 8: Mixed effects variable rule analysis of SMLS (L1) vs. multiple letter forms (L2+L3), interaction with region

Region	Token count	Logodds	Proportion L1/L2+L3	Centred factor weight
London	156	0.927	0.724	0.716
Birmingham	128	0.588	0.664	0.643
Bristol	200	0.249	0.565	0.562
Belfast	166	-0.474	0.458	0.384
Manchester	144	-0.590	0.417	0.357
Glasgow	137	-0.699	0.394	0.332

3.2.4 Phonological comparison of the corpus tokens and citation forms

As described in the Methodology, fingerspelling annotations for lexical database items were given an additional suffix to indicate whether the corpus instance was more, less or equally nativised phonologically in comparison to the SignBank citation form. Analysis of these suffixes reveals that variation from citation form was uncommon. The vast majority – i.e. 392 of the 421 lexical item tokens (93.1%) – were deemed to be "equally nativised", that is, they were either articulated very closely to the citation form itself, or in cases where they did vary, they did not remove or resolve any violations of native phonological constraints or add any native parameters. Only 3 tokens (0.7%) were deemed "less nativised". Additionally 27 tokens (6.4%) representing 13 different lexical items were deemed to be "more nativised" in that they reduced the violation of phonological constraints by altering manual alphabet handshapes, deleted manual alphabet letters or added native parameters not present in the citation form.

4 Discussion

This study set out to determine the frequency of nativised and non-nativised fingerspelling tokens in a sample of the BSL Corpus, and how those frequencies might be spread across the model of fingerspelling nativisation proposed by Cormier et al. (2008; see Figure 9); to determine whether social factors correlate with the production of nativised and/or non-nativised forms of fingerspelling; and to examine specific examples within the BSL Corpus of manual alphabet production being altered in order to conform more closely to the over-arching phonological constraints on native sign production.

4.1 Frequency of fingerspelling

The overall frequency of fingerspelling found (see §3.1.1) is generally consistent with previous studies. For example, the 44.3% rate of SMLS/initialisations versus longer fingerspelling found here for BSL (within the subset of fingerspelling-related tokens) is fairly close to that of the 46.8% rate found in the McKee and Kennedy (2006) NZSL study, suggesting a similar rate of SMLS across these two varieties of BANZSL.

4.2 Social factors and nativisation

In terms of social factors involved in nativised and non-nativised fingerspelling, we found that gender and language background were not significant but that a combined effect of age and region were. Our results are consistent with previous suggestions that non-nativised fingerspelling is used more frequently by the BSL community in certain regions, especially Scotland and Northern Ireland, and by older members of those regions in particular (Sutton-Spence et al. 1990; Sutton-Spence 1994; Brennan 2001). All the correlations have dependable levels of significance, although the variation of individuals from the models is quite high, indicating that at least one other factor is having a substantial effect. It is possible that this could be some other demographic factor that was not considered, but given that proper nouns and "technical" vocabulary have long since been identified as a primary use of fingerspelling, it seems likely that the register and conversational topics selected by the participants made a considerable contribution to this variance.

Regional variation made more of a contribution than age to fingerspelling nativisation patterns, with age only having a marked effect on non-nativised fingerspelling production in specific regions. More than 20 years have elapsed since the most recent usage-based study of BSL fingerspelling variation (Sutton-Spence 1994). The generations of Scottish signers who were in statutory education pre-1950, for whom fingerspelling might have been a more common teaching tool than their contemporaries in England, are now in their seventies at the very least. Additionally, the youngest of those who received compulsory education in England after the 1968 publication of the Lewis report (Department of Education and Science 1968) – which possibly made it more acceptable to fingerspell in schools, but not necessarily to sign – were at least in their fifties at the time the BSL Corpus data was collected. Looking at the general distribution across age groups in Figure 13, the production of non-nativised fingerspelling for the sample as a whole is more uniform below the age of 60. Assuming no further radical changes in deaf education policy across the UK, it is possible that in another 20 years we might see no effect of age at all.

It is also noteworthy that when fully nativised manual alphabet forms (N3) are modelled against non- and partly-nativised fingerspelling (N1 and N2, see §3.2.2), age is not a significant factor, though region remains so. Taken together, these findings indicate that while older BSL users are more likely to employ non-nativised fingerspelling in specific regions (i.e. Glasgow and Belfast), they remain as likely as younger signers in the same region to use more nativised manual alphabet constructions. Using the apparent time hypothesis which states that age differences are indicative of language change (Bailey et al. 1991), this suggests that language change is underway in non-nativised fingerspelling (but not nativised fingerspelling) in Glasgow and Belfast.

4.2.1 Older signers in Glasgow and Belfast

In addition to the typical use of fingerspelling for names, places and written abbreviations, almost all of the participants in Glasgow and Belfast over age 60 made repeated use of full spelling to represent concepts for which there exists at least one lexical sign in native BSL vocabulary, examples being *sugar, salt, boarding, years, flu, been, war, school, tree, house, speech, castle, but, outside*. In some cases, there was evidence of an English influence beyond vocabulary on the syntactic structure of the narratives, with fingerspelled representation of English phrasal verbs such as "used to" and "go ahead", although some of these represent reported English speech and should be taken as examples of code-switching rather than borrowing. These phenomena were by no means confined to Glasgow and Belfast and can be found in individuals elsewhere, but were most common in these two regions in older signers. It should be noted that this does not entail that these older participants are unaware of equivalent BSL vocabulary: they may fingerspell specific terms or in general as a matter of personal preference, influenced by the educational methods prevalent at the time of their upbringing (Schembri et al. 2010; see also §1.8).

4.2.2 SMLS/initialisations in London and Birmingham

London, and to a lesser extent Birmingham, showed more frequent use of one-letter signs (see §3.2.3). A good number of these represented proper nouns which could have been fingerspelled more fully or for which a native lexical sign equivalent exists (e.g. *Plymouth, Brighton, Nottingham, Georgia, Madrid*). Others could be classed as nonce usage where native lexical signs may or may not exist but signers may prefer for whatever reason to express the concept with an English loan, for example SMLS representing the English terms *annual leave, clinic, pound, west, shilling, tool, sand,* and *festival*. Of the L1 tokens from the native lexicon, most were signs in semantic categories discussed above as common for SMLS use such as family relationships and time/duration, most of which appear in every region and are among the most frequent SMLS tokens across the sample.

It is therefore not so much the frequency of lexicalised SMLS that makes these two regions' usage distinctive, but the apparent propensity to employ nonce SMLS. While the focus of this study has been on the manual phonology of fingerspelling and signs, one previously mentioned strategy for disambiguating an SMLS from other terms beginning with the same letter is that they can be accompanied by an English mouth pattern, especially in cases where the initialised letter is more frequently used than other letters (eg. -c-, -g-, -m-, -y-). However, the reverse also holds: the co-production of a single manual alphabet letter may help to disambiguate a mouth pattern for lip-reading purposes. Two different mouthed words may be very difficult to tell apart, for example "Dublin" and "tablet": the co-production of a manual alphabet letter might help to identify the context. It is possible that the more frequent SMLS use in London and Birmingham is better explained as a preference for or a willingness to switch to and from spoken language mouth patterns, rather than an example of regional lexical variation *per se* – this would be a fruitful area for future research.

4.3 Phonological comparison of the corpus tokens and citation forms

4.3.1 Nativisation and lexicalisation in the BSL Corpus and BSL SignBank

By far, most of the lexical item tokens in the BSL Corpus were deemed to be "equally nativised" in comparison to the citation form of that sign in BSL SignBank (see §3.2.4). That is, they were either articulated in exactly the same way as the citation form itself, or any variation from citation form did not result in further violations of native phonological constraints or any added native parameters.

Only a few were deemed "less nativised": arguably all three of these tokens are more indicative of inconsistency in annotation. For example, the citation form of BY smooths the transition between letters by retaining the non-dominant handshape of the -b- throughout, conforming with Battison's Dominance

Condition. This corpus instance was simply citation form -b-y-, breaking that constraint, and perhaps should have been annotated as FS:BY.

A handful of other tokens were deemed to be "more nativised" in that they reduced the violation of phonological constraints, deleted manual alphabet letters or added native parameters not present in the citation form. More nativised variants which occurred more than once (e.g. SOUTH and PORTSMOUTH) were only produced by conversational partners: their relative frequency might be explained by each partner's accommodation to the other. Several more (e.g. IF, OR, EAST, WEST) represent examples of SignBank specifying an unusually non-nativised form that is fingerspelled in full or specifies an initialised manual alphabet letter not seen in Corpus production. This likely reflects principled decisions about citation forms for fingerspelled loans in SignBank – i.e. that given a set of related nativised variants for potential inclusion in SignBank, the citation form shown is the one that appears to be least nativised (Cormier et al. 2012). However, it is important to note that BSL SignBank is a work in progress, and that degree of nativisation is just one of several criteria considered when selecting a citation form – others being for example, token frequency in corpus, association with a priority social group, etc. (Cormier et al. 2012). As more annotation is undertaken of the BSL Corpus in future, a clearer picture of frequency and other criteria will emerge which may affect citation forms chosen to represent particular variants in BSL SignBank.

A similar issue arose with the lexical status of some SMLS and fingerspelled loans. For example, the tokens GARAGE and FS:G-GOSSIP as identified in the BSL Corpus were identical in terms of manual phonology and reduction from the full word, yet the former is considered a lexical item (listed in BSL SignBank) while the latter is not. Furthermore, apparently lexicalised loans such as CHANCE, EXCUSE02, GEOGRAPHY, UNCLE and YOGHURT did not occur once in this project's sample, while non-lexicalised nonce SMLS and SMLS/native compounds representing loans of the English words *arthritis*, *but, club, to, west* and *Woolworths* all appeared more than twice and from more than one participant. This was certainly a matter of chance, and the larger the corpus sample, the clearer the picture of frequency and therefore of lexicalisation becomes. Again, the fact that SignBank is a living dictionary and can change according to newly arising data from the corpus means that changes can be made when more evidence emerges about a sign's lexical status.

4.3.2 Local nativisation

Although (as noted in §1.6) local nativisation is argued to be common in ASL, very few instances of local nativisation were identified in this study during analysis, reinforcing the view of Sutton-Spence (1994) that in BSL reductions are most often created that way from the start. In one of the few examples of local nativisation, participant BL15 spells the name "Norman" in full the first time, and refers to him thereafter with a reduced sign name consisting only of -n-.

As a possible consequence of this preference in BSL for reduction, a phenomenon that might be referred to as "local de-nativisation" was as often observed. For example, BF18, recounting an incident at an airport, initially refers to the word *terminal* with a nonce SMLS of -t-, and not long afterwards spells out the word almost in full. In cases like this, it may be that signers sense that the initially produced nonce sign was not understood.

4.4 Assessment of the theoretical model's application in practice

Overall, the BSL Corpus fingerspelling data did all fit into the various positions set out in the working nativisation model in Cormier et al. (2008), as shown in Figure 9. Two minor issues are of note.

With regard to one-letter signs in BSL, as most SMLS conform to phonological constraints from the outset, the top level category (L1N3 in this study) makes no distinction between simple SMLS such as FATHER, where the phonological parameters of the sign are identical to a manual alphabet letter, and initialisations which have *added* native parameters such as RECOMMEND and GOLD (see §1.5). The partly-nativised single letter category (L1N2) was only found to contain SMLS that use the citation form of the letter -m- and single

letters compounded with native signs. The split between L1N2 and L1N3 is more even in ASL, where there is a larger number of fingerspelled letters that contain parameters (specifically handshapes) that do not occur in the native lexicon. There are simply few letters that do not conform to native phonology in BSL – possible examples included in Cormier et al. (2008) include the -m- handshape in MOTHER, and the sign UNCLE in which the pinky finger of the non-dominant hand may move to facilitate contact with the dominant hand. But there may not be many more in BSL.

One way to address this is to consider the model in terms of a continuum rather than a set of discrete categories, as suggested by Cormier et al. (2008). It may be that initialised BSL signs like RECOMMEND and GOLD should more appropriately be considered even more nativised than SMLS, requiring more granularity in the coding scheme (e.g. "L1N4").

It was also noted that in BSL fully nativised sequences with three letters or more (L3N3) are very hard to find. In the current study, no tokens were given this code. The only BSL example cited in Cormier et al. (2008) was the sign listed in BSL SignBank at the time of writing as ABOUT03*, described as being the end result of a "nativisation path" which had 3+ letters at a mooted earlier point (-a-b-o-u-t- > -a-b-t > ABOUT > ABOUT03*), as shown in Figure 20. However, full constraint conformity is only achieved when all but the letters -a- and -t- have been deleted (the sign ABOUT), replacing them with a circular movement; ABOUT03* arguably loses even those. As noted in Cormier et al. (2008:30), it can be difficult to know with fully nativised forms whether these have non-native origins in the first place, and this is particularly true of multiple letter loans like ABOUT03* which look very much like any native sign and where fingerspelling origins may be difficult to see at all. Nativisation pathways such as that for -a-b-o-u-t- as shown in Figure 20 can help provide some evidence of a non-native form, and Deaf native signer intuitions can help as well. But if such a pathway no longer exists and/or if the etymology of a given form cannot be traced back to determine if its origins are indeed non-native, then this can prove a challenge.

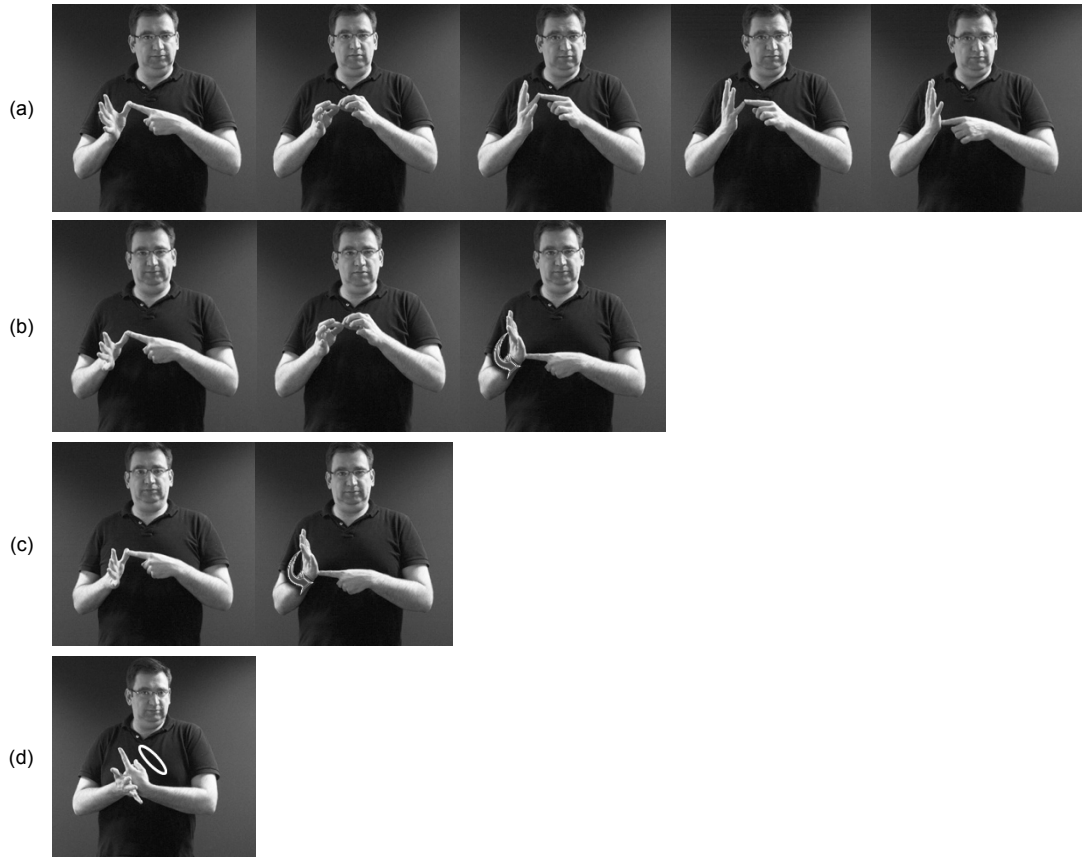

Figure 20: Nativisation pathway in BSL from fully fingerspelled (a) -a-b-o-u-t- to (b) -a-b-t- to (c) ABOUT to (d) ABOUT03* (from Cormier et al. 2008).

In the current study an "annotate only what you see" approach was taken, and for all four instances of the sign ABOUT in the sample, no more than two letters were seen. ABOUT03* itself was not lemmatised at the time of writing and was therefore not counted (a cross-check found only one instance of it in the sample). Even with this approach however, determining the number of letters that are in a given form can be difficult. For example, in the current study, the sign SEX (see Figure 21) was categorised as L2N3 as it was considered to contain -s- and -x-. However, it is also possible to argue that SEX contains all three letters (-s-, -e- and -x-) in which case it could be categorised as L3N3. Thus it is clear that determination of the number of letters actually contained in a fingerspelled loan is to some degree subjective. Additionally, while highly nativised fingerspelled forms certainly do exist in BSL (as evidenced by the number of N3 signs in Table 3), the strong preference for reduction to a single letter (i.e. SMLS, L1N3) means that multiple letter fully nativised forms are not as common in BSL.

Figure 21: BSL SEX

4.5 Conclusions and future directions

We have established empirically that the range of fingerspelled borrowing in BSL is diverse, from full letter-by-letter renditions of external orthographies, through deletions and abbreviations, to highly nativised forms which are constrained by native BSL phonology. Additionally, fingerspelling in BSL is clearly subject to phonological change, with only a third of all fingerspelling-related tokens being fully fingerspelled words and the rest nativised in some way.

We have also shown that the likelihood that a particular form of fingerspelling occurs within an individual user's production has been shown to be dependent on social factors. There was no significant effect of gender or language background, but a combination of region and age correlated significantly with non-nativised fingerspelling production (i.e. full fingerspelling was relatively favoured by older signers in Glasgow and Belfast). This confirms previous findings (e.g. Sutton-Spence 1994) but also provides evidence of further language change since that study was done. Furthermore, region alone correlated significantly with more nativised forms. In London and to a lesser extent Birmingham there was a marked preference for using SMLS (one-letter) signs: from a review of tokens in that category, it appears that what was unusual in those regions was not the production of lexicalised SMLS but the ad hoc creation of "nonce SMLS". In the future, it would be interesting to see which of these patterns signers are aware of, what attitudes they hold about fingerspelling and SMLS, and how these relate to their own social factors. The implications of accompanying mouth patterns mentioned in §4.2.2 above also warrant further investigation. A future study looking at co-produced mouth patterns with fingerspelling would be useful to determine whether mouth patterns are being used by certain social groups to disambiguate fingerspelling loans, or whether the fingerspelling is being used to clarify mouth patterns.

Lastly, no comparable studies of the sociolinguistic variation in nativisation extent for one-handed manual alphabet systems have been carried out. It would be illuminating if future research could demonstrate whether the type of model considered can be usefully applied to usage data from one-handed fingerspelling systems with a view to reinforcing the case that it is a cross-linguistic model.

Abbreviations/conventions used

- Manual alphabet fingerspelling is represented by lower case letters surrounded by hyphens, e.g. -a-l-p-h-a-b-e-t-, -z-.
- Lexical BSL signs are represented by the unique ID gloss of the citation form listed in the BSL SignBank lexical database (http://bslsignbank.ucl.ac.uk) in small capitals, e.g. LUCK, VISIT02. Unpublished signs not available to the public at the time of writing are suffixed with an asterisk, e.g. ABOUT03*. Researchers can register with BSL SignBank to access the full database including unpublished ID glosses.
- Single Manual Letter Signs are indicated with an additional underscore below the letter the sign is formed from, e.g. MOTHER, GARAGE.
- The FS: prefix indicates a specific fingerspelling annotation as used in the BSL Corpus, followed by the fingerspelled word in all caps e.g. FS:WOOLWORTHS, as per the BSL Corpus annotation conventions (available at http://bslcorpusproject.org/cava).

Acknowledgements: This paper is based on the first author's thesis submitted in partial fulfilment of MSc Language Sciences (Sign Language Studies specialisation), Division of Psychology and Language Sciences, University College London, 2014-2015. We thank Dr Daniel Ezra Johnson for technical support and Dr Rachel Sutton-Spence for support and inspiration. We also thank Heidi Proctor for the support with consistency checking. Finally we thank BSL Corpus Research Assistants Sandra Smith and Sannah Gulamani for the support with searching BSL SignBank for nativised fingerspelling, as well as other advice, challenging questions, encouragement and sense of humour.

This work was supported by funding from the Economic and Social Research Council of Great Britain (Grant RES-620-28-0002, Deafness, Cognition and Language Research Centre (DCAL) and the Digging into Data Challenge which for this project included joint funding from Joint Information Systems Committee (JISC), Arts and Humanities Research Council (AHRC) and Economic and Social Research Council (ESRC) in the UK (grant 3152) and the NWO in the Netherlands (grant 640.006.011).

Figure 9 and Figure 20 are from "One hand or two? Nativisation in fingerspelling in ASL and BANZSL", *Sign Language & Linguistics* 11:1 (2008), reprinted with kind permission from John Benjamins Publishing Company, Amsterdam/Philadelphia [www.benjamins.com].

Competing Interests: The authors declare that they have no competing interests.

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