THE EFFECT OF AGE-GROUP AND PLACE OF L1 ACQUISITION ON THE REALISATION OF PANJABI STOP CONSONANTS IN BRADFORD: AN ACOUSTIC SOCIOPHONETIC STUDY

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Abstract

This paper describes a cross-sectional spectrographic sociophonetic study carried out on three groups of speakers, with a follow-up study on a fourth group (48 subjects in all), to investigate the possible effects of age and of place of L1 acquisition (Pakistan or UK) on the realisation of stop consonants in first-language Panjabi speakers living in the Manningham area of Bradford. Results indicate that while no changes are evident in the realisation of voiceless and aspirated stops, the voiced stops are undergoing a process of devoicing amongst speakers below the age of about 25 who acquired Panjabi in Bradford. We suggest that the phonetics and phonology of English stops, and the vocal tract dynamics of voicing, are having a clear influence on the manner in which this change is taking place.

1. Introduction

This study investigates to what extent certain phonetic changes may be in progress in the main variety of Panjabi currently spoken in the Manningham area of Bradford, a city of about 301,400 inhabitants situated some 18 kilometres to the west of Leeds in West Yorkshire, England.[1] The phonetic changes in question concern the onset of vocal fold vibration during the production of stop phonemes which, if our data are representative, is changing in such a way as to re-align the voice onset patterns of Panjabi stops to parallel those of English, the majority language. These changes are observed in our data almost exclusively in speakers below about the age of twenty five who acquired Panjabi in Bradford. Older speakers in our sample, with one exception, do not show significant signs of these changes even where they also acquired their Panjabi in Bradford.

We provide some information on the background of the Manningham Panjabi-speaking community as well as on the relevant phonetic and phonological characteristics of Panjabi. We then present the results of our acoustic analysis and discuss them from a general sociolinguistic perspective, placing them in the context of the possible emergence of British varieties of Panjabi distinct from those of the Indian subcontinent (Stuart-Smith & Cortina-Borja in press).

2. Geographical origins of the speech community

In 1962 work was begun on the Mangala Dam in the Mirpur District of Pakistan between Islamabad and Jhelum. 110,000 people, mostly engaged in agriculture, were displaced to make way for the dam. While many were resettled nearby, a substantial number emigrated to the UK. Bradford's textile industry offered employment opportunities and many settled in the Manningham area to take these up, joining a significant number of

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people of Pakistani origin already living and working there. About 15,000 people of Mirpuri origin are today resident in Manningham.

2.1 Linguistic origins of the speech community

Members of the Manningham Panjabi speech community refer to their form of Panjabi as Mirpuri but this is not a term widely used by linguists in dialect classifications. Masica (1991: 18) uses the term Poṭohari for the variety of Western Panjabi spoken in the south-eastern hinterland of Islamabad which includes Mirpur District, but our informants are quite adamant that although Poṭohari is similar it is not the same. Grimes (1996) gives an indication of the complexity of the dialect situation in this area and concludes that a proper survey is needed, as does Masica (1991: 20).

We will use the term Mirpuri, also used in Stubbs (1985), for the variety spoken in Manningham although our results are consistent with the notion of emergent varieties of British Panjabi (Stuart-Smith & Cortina-Borja in press) and it may be that the variety as it is spoken in Manningham is recognisably different from that spoken now in Mirpur District. Certainly, anecdotal evidence suggests this is the case.

3. The social context

Manningham is a district of Bradford immediately to the north of the city centre consisting of about 2.5 square kilometres of mainly terraced housing with a population of some 30,000 people. It is one of the least prosperous areas of the city with 32% unemployment against 11% for Bradford as a whole. Fifty per cent of residents are of Pakistani origin with a larger proportion under 25 years old than is the case among other ethnic groups. In First Schools (attended between the ages of 5 and 9) 70% of pupils reportedly have Panjabi as their first language (Bradford Education 1996).

The population of people with Pakistani origin has risen in the part of West Yorkshire administered by Bradford Metropolitan District Council (total population 483,000) from c.3,000 in 1961 to around 65,000 today, and is projected to reach 103,000 by the year 2011. It is clear from these figures that the number and proportion of speakers of Mirpuri Panjabi is set to grow and the language variety itself set to become an even more significant linguistic code in the life of the region, provided it is not deserted by its speakers through wholesale language shift.

4. The stop phonemes of Panjabi

Panjabi has oral stops at five places of articulation - labial, dental, retroflex, palatal and velar (Tolstaya 1981: 8-10; Bhatia 1993: 330-332). Historically, these continue the Indo-Aryan system of stops (Masica 1991: 94) although instead of four stops at each place of articulation Panjabi has three having lost the voiced aspirate series (Masica 1991: 102). Panjabi therefore has five triads of voiced, voiceless and aspirated stop phonemes. The members of these triadic oppositions are distinguished from each other in realisation principally by the well-known parameter, or cluster of interrelated parameters, known as voice onset time (VOT) (Lisker & Abramson 1964) such that voiced phonemes are realised with voicing during the hold phase of the articulation (prevoicing), voiceless phonemes are realised without prevoicing and typically involve a relatively short delay after the release of the stop closure before voicing begins (short voice lag), and aspirated phonemes are realised also without prevoicing but with a significantly longer delay after release before the onset of voicing (long voice lag). The three types of stop phonemes, then, correlate exactly with the three phonetic VOT categories of prevoiced, short lag and long lag as set out in Table 1; we shall refer to this as the 'expected' VOT pattern for Panjabi. It should be understood, however, that VOT may not be the only phonetic exponent of these oppositions, a point we will return to later.

The three VOT categories correlate with three different glottal configurations during the hold phase of the stop: for prevoicing the glottis is adducted by the application of moderate medial compression and moderate adductive tension by the intrinsic laryngeal musculature (Laver 1980); short lag stops involve slight abduction of the glottis forming a narrow aperture compared to long lag stops which exhibit a much wider glottal opening (Catford 1977: 114-5). Short and long lag stops involve progressively less medial compression and adductive tension than is found in prevoiced stops.

Table 1. Correlation of stop phonemes and VOT categories in Panjabi (expected pattern)

LABIALS			DENTALS			PALATALS			VELARS		
voiced	voice-less	aspira-ted	voiced	voice-less	aspira-ted	voiced	voice-less	aspir-ated	voiced	voice-less	aspira-ted
pre-voiced	short lag	long lag	pre-voiced	short lag	long lag	pre-voiced	short lag	long lag	pre-voiced	short lag	long lag
b	p	p^{h}	d	t	t^{h}	dʒ	tʃ	tʃ^{h}	g	k	k^{h}

Note also that the palatal stops are affricates while the rest are plosives. Consequently, the VOT values for realisations of the voiceless and aspirated palatal stops are considerably greater than for the other places of articulation due to the period of voiceless homorganic friction that follows the release of the occlusion in these affricates.

5. Research question

The aim of the study is to see if the age of a speaker and the place where he/she acquired Panjabi as their first language affect the extent to which he/she will exhibit the expected VOT pattern for Panjabi stops. The independent (social) variables are therefore (1) age of speaker, and (2) place of first language acquisition. The dependent (linguistic) variable is VOT behaviour in the realisation of stops.

6. Subjects

Twenty nine speakers whose first language is Panjabi were assigned to one of three groups to function as a cross-sectional sample:

Group A - Aged over 25 years, acquired Panjabi in Mirpur, Pakistan;
Group B - Aged over 25 years, acquired Panjabi in Bradford, UK;
Group C - Aged 12-22 years, acquired Panjabi in Bradford, UK.

It was not possible in the time available to ensure equal numbers of males and females in each group, nor was it possible to age-match the members of groups A and B. It is not known to what extent these shortcomings need to be taken into account when drawing conclusions from the results. The gender and age composition of the groups is:

Group A - 5 males, 5 females; Age range 27 - 49, Mean age = 37.0 years
Group B - 2 males, 7 females; Age range 26 - 34, Mean age = 30.7 years
Group C - 0 males, 10 females; Age range 12 - 22, Mean age = 17.5 years.

(For the ages of individual members, see Appendices 2, 3 and 4.)

All members of group A came from Mirpur District in Pakistan, and all members of groups B and C can trace their family origins to Mirpur.

6.1 Other variables

A further variable which is doubtless of great significance is the speakers' age of acquisition of, and level of proficiency in, English. It was not possible to gain accurate information about these although it can be assumed that speakers in groups B and C had begun to acquire English at least by the age of five as they will all have started attending English-medium schools in the Bradford area at that age. Level of proficiency in Panjabi, and the patterns of its usage across the speakers, are highly likely also to be significant variables but we have not been able in this study to obtain the information needed to profile these.

6.2 Methods and procedures

To investigate the research question, speakers in each group were given a picture-naming task to elicit words beginning with each of the stop phonemes except for the three retroflex ones. Retroflex stops were excluded because it seems that at least some British-born speakers of Panjabi may be merging the retroflex phonemes with the dental ones (Stuart-Smith & Cortina-Borja in press).

The target words chosen are all mid-tone items (sometimes described as non-tonal) therefore the effect on VOT of high and low tones found by Stuart-Smith & Cortina-Borja (in press) will not be a confounding variable. Appendix 1 lists the target words.

Subjects were asked to complete the task twice, embedding the target word in the carrier phrase /e – e/ ('This is a – '), and all did so except speakers SD of group B and SZ of group C who only performed the task once. The carrier phrase ensured that each stop occurred in an intervocalic context which it was felt would maximise the probability of prevoiced realisations of the voiced phonemes. Each session was tape-recorded onto analogue tape using a Sony Professional audio cassette recorder in a quiet room in Manningham Health Centre.

6.3 Data analysis for first study

The recorded utterances were fed into a Kay DSP5500 Sonagraph with synchronised spectrographic and waveform displays for VOT analysis. Realisations showing voicing just prior to release, and those showing voicing through most of the hold phase but ceasing just prior to release, were labelled 'prevoiced'. These two types of prevoicing have also been noted in Hindi voiced stops (Davis 1994: 182). Realisations that were not prevoiced were measured to obtain positive VOT values by taking the durational measure between the stop burst and the second glottal pulse of voicing for the following vowel; burst and/or aspiration noise often obscure the first glottal pulse on acoustic displays due to its much lower amplitude. Salient findings are summarised in Tables 2-4 below. The individual VOT results are displayed in Appendices 2-4.

6.4 Results of first study

We present the results for each phoneme category – voiced, voiceless, aspirated – in turn and compare them across the three groups of speakers.

6.4.1 Voiced stops

As mentioned above, it is expected that realisations of voiced stops in Panjabi, as in other Indo-Aryan languages, will exhibit prevoicing. The focus of interest is therefore to what extent each group conforms to this expectation. Each group member is given a 'prevoicing score' expressed as the number of prevoiced realisations of voiced stops over the total number of realisations of voiced stops (see Tables 2a, b, c).

Table 2a**.** Prevoicing scores for Group A.

SPEAKER	**PREVOICING SCORE** prevoiced tokens/total N of tokens	**DEVOICED TOKENS**
MY	8/8	none
PS	8/8	none
MA	8/8	none
AZ	8/8	none
MB	8/8	none
DA	8/8	none
MT	8/8	none
SK	8/8	none
KB	7/8	/d/ (1)
TA	3/8	/d/ (2), /dʒ/ (2), /g/ (1)
TOTAL (group A)	**74/80 = 92.5%**	

Table 2b**.** Prevoicing scores for Group B.

SPEAKER	**PREVOICING SCORE** prevoiced tokens/total N of tokens	**DEVOICED TOKENS**
RT	8/8	none
PH	8/8	none
FN	8/8	none
HA	8/8	none
SD	4/4	none
AH	7/8	/d/ (1)
IM	7/8	/d/ (1)
TK	7/8	/dʒ/ (1)
AY	7/8	/dʒ/ (1)
TOTAL (group B)	**64/68 = 94.1%**	

Table 2c**.** Prevoicing scores for Group C.

SPEAKER	**PREVOICING SCORE** prevoiced tokens/total N of tokens	**DEVOICED TOKENS**
SZ	4/4	none
SB	5/6	/dʒ/ (1)
ND	4/7	/d/ (2), /g/ (1)
RZ	4/8	/d/ (1), /dʒ/(1), /g/ (2)
SM	4/8	/dʒ/ (2), /g/ (2)
SA	2/7	/d/ (1), /dʒ/ (2), /g/ (2)
JB	2/8	/b/ (2), /dʒ/ (2), /g/ (2)
ZH	2/8	/b/ (2), /d/ (1), /dʒ/ (1), /g/ (2)
SQ	0/7	all
WS	0/8	all
TOTAL (group C)	**27/71 = 38.0%**	

Groups A and B had prevoicing scores of 74/80 (92.5%) and 64/68 (94.1%) respectively. None of the19 speakers except one, speaker TA,[2] had more than one devoiced realisation, and 13 of them had none. With no significant difference on this measure ($p = 0.65$, 2-sided Fisher exact Chi-Square test), the two groups can be collapsed into a single group (A+B) defined as over 25 years old. The score for group A+B is therefore 138/148 (93.2%). Group C, however, had a prevoicing score of only 27/71 (38.0%) showing extensive devoicing, with only two speakers having maximum or near-maximum scores for prevoicing. Because group C speakers had several data points missing we decided to include data from another group of under 25 years subjects before statistically comparing them with the older speakers.

Finally, it is noticeable that where devoicing occurs it is neither equally nor randomly distributed across the four places of articulation represented in the data. We shall return to this point later.

6.4.2 Voiceless stops

It is expected that voiceless stops will be realised without prevoicing and with a short delay after the release of the occlusion before the onset of voicing for the following vowel. Ranges, means and standard deviations for the three groups' VOT values are given in Table 3. Four speakers in group C (SZ, JB, WS and ZH) realised /p/ with a long voice lag, showing VOT values similar to their realisations of the homorganic aspirated stop /p^h/. Two of them (SZ and ZH) showed this pattern in their realisations of /t/ as well (see Appendix 4). As we cannot be certain that these subjects were sufficiently familiar with the two lexical items – *pul* (bridge) and *tala* (lock) – we have decided to discount these data points.

Table 3. VOT data for voiceless stops in Groups A, B and C (in milliseconds).

GROUP A	/p/	/t/	/tʃ/	/k/

[2] It is difficult to know how typical or otherwise speaker TA is, but within the sample she is clearly very different from the other speakers who have maximum or near-maximum prevoicing scores.

Range	0-39	10-45	28-80	22-55
Mean	22	25	50	38
SD	11	10	15	9
GROUP B				
Range	0-38	11-28	39-71	27-55
Mean	27	21	53	35
SD	11	5	9	7
GROUP C				
Range	14-36	9-28	38-98	20-36
Mean	23	19	57	30
SD	9	5	18	5

In all three groups the VOT ranges, means and SDs for each place of articulation are too similar to mark any group out as significantly different from any other. The conclusion is therefore that all speakers irrespective of age or of place of L1 acquisition realise the voiceless stops in the expected way – i.e. with a short lag before the onset of voicing.

6.4.3 The aspirated stops

The expected pattern with the aspirated stops is that realisations will exhibit a long voice lag compared to the voice lag evident in realisations of homorganic voiceless stops. Ranges, means and standard deviations for the three groups' VOT values are given in Table 4.

The situation is much the same here as with the voiceless stops – all three groups exhibit similar VOT behaviour with all speakers realising the aspirated stops with the expected long lag relative to the homorganic voiceless stop.

Table 4. VOT data for aspirated stops in Groups A, B and C (in milliseconds).

GROUP A	/pʰ/	/tʰ/	/tʃʰ/	/kʰ/
Range	47-98	44-88	63-136	39-108
Mean	75	63	100	68
SD	15	13	21	18
GROUP B				
Range	58-102	39-108	66-164	41-98
Mean	80	67	109	67
SD	16	18	31	16
GROUP C				
Range	52-134	56-120	70-109	42-84
Mean	83	86	98	68
SD	22	15	17	11

6.5 Results of follow-up study

The first study indicated that speakers below 25 years who acquired Panjabi as their first language in Bradford were devoicing voiced stops to a very significant extent compared to the older speakers. It also indicated that they were realising voiceless and aspirated stops in the same way as the older speakers. To check the reliability of these findings we replicated the first study using nineteen subjects aged 10-11 years who were born in Bradford and whose first language is Panjabi. All subjects are resident in Manningham, have family origins in Mirpur, and attend the same Middle School in Bradford. The same procedures and methods were used except that we did balance for gender, and the data collection session was conducted entirely in Panjabi. The gender composition of the group (referred to as Group D) was 10 males and 9 females. The main findings are summarised in Tables 5-9, while Appendix 5 shows the VOT behaviour for each speaker.

As in group C, we found some uncertainty regarding some lexical items. Values affected by this are marked with an asterisk in Appendix 5 and have been excluded from analysis and from the computation of means and standard deviations. However, in none of the groups was there any evidence of uncertainty over those lexical items used to elicit realisations of voiced stops.

6.5.1 Voiced stops

As with groups A, B and C, a prevoicing score was assigned to each speaker, as indicated in Table 5.

Table 5. Prevoicing scores for Group D. Gender of speaker shown in left-hand column.

SPEAKER (gender)	**PREVOICING SCORE** prevoiced tokens/total N of tokens	**DEVOICED TOKENS**
AS *m*	7/8	/d/ (1)
SN *f*	6/8	/b/ (1), /d/ (1)
AN *f*	6/8	/b/ (1), /d/ (1)
II *f*	6/8	/d/ (1), /g/ (1)
TX *f*	5/8	/b/ (1), /dʒ/ (1), /g/ (1)
AK *f*	5/8	/d/ (1), /dʒ/ (1), /g/ (1)
AX *m*	5/8	/b/ (1), /g/ (2)
SI *f*	5/8	/dʒ/ (1), /g/ (2)
ST *f*	4/8	/b/ (2), /dʒ/ (1), /g/ (1)
MX *m*	4/8	/d/ (2), /dʒ/ (1), /g/ (1)
AM *m*	4/8	/b/ (1), /d/ (1), /g/ (2)
TG *f*	3/8	/b/ (1), /d/ (1), /dʒ/ (1),/g/ (2)
AR *m*	2/8	/b/ (1), /d/ (2), /dʒ/ (1),/g/ (2)
YN *m*	2/8	/b/ (1), /d/ (2), /dʒ/ (2),/g/ (1)
SR *m*	2/8	/d/ (2), /dʒ/ (2),/g/ (2)
ZA *f*	1/8	/b/ (1), /d/ (2), /dʒ/ (2),/g/ (2)
SM *m*	0/8	all
NG *m*	0/8	all
AJ *m*	0/8	all
GROUP TOTAL	**67/152 = 44.1%**	

The group total percentage prevoicing score is similar to that obtained from the group C data - 67/152 (44.1%). The difference between groups C and D is not significant (p = 0.81, 2-sided Fisher exact Chi-Square test), and they can be collapsed on this measure into one group (C+D) defined as under 25 years with a prevoicing score of 94/223 (42.2%).

The difference between A+B and C+D is highly significant ($p < 0.005$, 2-sided Fisher exact Chi-Square test).

The conclusion on the basis of the sample therefore is that devoicing of voiced stops is widespread amongst speakers under 25 years but not amongst speakers over 25 years; in the latter group the place of acquisition of Panjabi – Pakistan or UK – seems to have little or no effect. It is not generally a case, however, of younger speakers consistently devoicing but of varying between prevoiced and devoiced realisations, a point we shall return to later. It is worth noting at this stage, however, that there does seem to be a gender effect in the devoicing data: there is only a 0.22 probability of a female speaker devoicing the voiced plosives more often than prevoicing them, whereas with the male speakers the probability is 0.60. This effect is made more interesting by the fact that all the group C speakers in the first study were female and showed extensive devoicing. They were older than the group D speakers, suggesting that perhaps the incidence of devoicing begins to increase in females as they go through their teens; further research is needed into this.

6.5.2 Voiceless stops

Table 6 gives the ranges, means and standard deviations for group D. These data corroborate the finding that speakers under 25 years realise voiceless stops in the expected way with respect to the VOT measure.

Table 6. VOT data for voiceless stops in Group D (in milliseconds).

	/p/	/t/	/tʃ/	/k/
Range	0-47	0-39	25-83	16-47
Mean	22	18	50	31
SD	11	08	15	08

6.5.3 Aspirated stops

Table 7 gives the ranges, means and standard deviations for group D. These data corroborate the finding that speakers under 25 years realise aspirated stops in the expected way with respect to the VOT measure.

Table 7. VOT data for aspirated stops in Group D (in milliseconds).

	/pʰ/	/tʰ/	/tʃʰ/	/kʰ/
Range	47-173	44-197	63-225	41-100
Mean	90	79	106	64
SD	27	32	38	15

7. Discussion

The clearest difference between groups A and B on the one hand, and groups C and D on the other is in the incidence of prevoicing in realisations of voiced stop phonemes. This was found to be statistically highly significant. Speakers in groups A and B taken together realise the voiced stops with prevoicing in all but ten out of 148 tokens (93.2%) across all nineteen speakers (see Table 8). Group C and D speakers, however, show much less prevoicing in their realisations of the voiced stops (42.2%) with the incidence of prevoicing decreasing as a function of the backness of the place of articulation (see Table 9). Fig.1 shows in graph form the information given in Tables 8 and 9.

Table 8. Incidence of prevoicing in voiced stops in relation to place of articulation in speakers in groups A and B combined.

	/b/	/d/	/dʒ/	/g/	**TOTAL**
N realisations	37	37	37	37	148
prevoiced realisations	37 (100%)	32 (86.5%)	33 (89.2%)	37 (100%)	139 (93.9%)

Table 9. Incidence of prevoicing of voiced stops in relation to place of articulation in groups C and D combined.

	/b/	/d/	/dʒ/	/g/	**TOTAL**
N realisations	55	54	57	57	223
prevoiced realisations	31 (56.4%)	24 (44.4%)	23 (40.4%)	16 (28.1%)	94 (42.2%)

Voicing in oral stops can only continue for a relatively short time because of the build-up of intra-oral airpressure. When this reaches a level equal to subglottal pressure airflow through the glottis becomes impossible and voicing terminates (Ohala 1997: 687). Intra-oral pressure increases more quickly if the articulatory occlusion is closer to the glottis, and this explains the pattern exhibited in Table 9 with /g/ being the most vulnerable to the devoicing process (Ohala 1997: 688) and /b/ being most resistant to it.

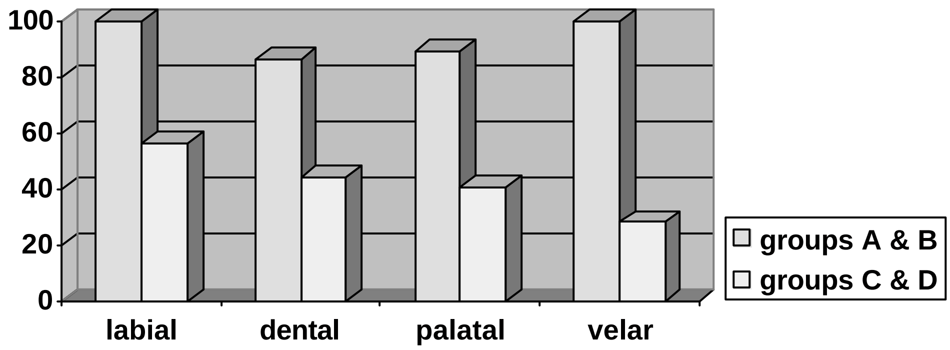


Fig. 1. Graph showing prevoicing in relation to place of articulation

Devoicing means that positive VOTs become potentially distinctive in voiced stops with respect to voiceless (and aspirated) stops. That is, we might expect the triadic stop opposition of Panjabi to be realised in younger speakers by three VOT lag categories - short lag, medium lag and long lag - as is reported for Korean (Kim 1970: 108; although Abramson (1977: 299) comments that VOT alone does not distinguish adequately between the short and medium lag categories that Kim sets up).We need therefore to test against the data of groups C and D the null hypothesis that *there is no significant difference in VOT values between devoiced realisations of voiced phonemes and realisations of homorganic voiceless phonemes*.

7.1 VOT values of devoiced stops

The devoiced realisations of the voiced stops in our data appear to align with the unaspirated stops in terms of positive VOT values. (See Appendix 4 for the VOT values for all three categories of stops for all the group C subjects, and Appendix 5 for the group D subjects; ranges, means and standard deviations for both groups are given in Table 10.)

Comparison of the voiced-voiceless pairs in each group shows that the ranges, means and standard deviations are too similar for VOT to distinguish between them – differences are generally no more than a few milliseconds. The null hypothesis therefore remains unrefuted for both groups and we must conclude that setting up a VOT category difference of short lag-medium lag cannot be made to correlate with the voiced-voiceless opposition in any of the four places of articulation in our group C or group D data.

Table 10. VOT data for comparison of devoiced realisations of voiced stops, and realisations of voiceless stops, in groups C and D.

Group		b	p	d	t	dʒ	tʃ	g	k
C	range	0-27	14-36	0-33	9-28	38-64	38-98	22-45	20-36
	mean	20	23	19	19	47	57	30	30
	SD	9	9	9	5	8	18	6	5
D	range	0-44	0-47	7-31	0-39	28-88	25-83	5-44	16-47
	mean	17	22	17	18	45	50	27	31
	SD	14	11	7	8	13	15	8	8

Paradoxically perhaps, this tendency to devoice and merge realisations of voiced and voiceless stops with respect to VOT values is a greater threat to the distinctiveness of the voiceless phonemes than to that of the voiced ones in that all short lag stops are, for a listener, ambiguous between voiced and voiceless phonemes, but any prevoiced stop is uniquely a realisation of a voiced phoneme. That is to say, amongst group C and D speakers there is unidirectional distinctiveness between voiced and voiceless stops on the VOT measure whereas in group A and B speakers distinctiveness is, for most of them, bidirectional (see Figs. 2a and 2b).

8. Conclusions

Insofar as a general pattern can be identified in our data it would seem that, with respect to VOT, speakers under 25 years are collapsing the three VOT categories of Panjabi into two categories, and that the two favoured categories are short lag and long lag, exactly the two VOT categories of English in word initial position. It is very common for voiced stop phonemes in English to have devoiced realisations with short voice lag even when preceded by voiced sounds (Ladefoged & Maddieson 1996: 50) and it is well known that English initial voiceless plosives are realised with relatively long lag times (Gimson 1980: 153). Table 11 shows the expected VOT pattern for English stops.

Table 11. Correlation of stop phonemes and English VOT categories (expected pattern).

LABIALS		DENTALS		PALATALS		VELARS	
voiced	voiceless	voiced	voiceless	voiced	voiceless	voiced	voiceless
short lag	long lag	short lag	long lag	short lag	long lag	short lag	long lag
b	p	d	t	dʒ	tʃ	g	k

Influence from English as the majority language, however, may not be the only factor behind this change. There may be an accelerating impetus from the fact that it is the prevoicing which is being lost, and prevoicing in obstruents is considered a marked feature (Kenstowicz 1994: 64); we might also consider it a marked feature to have three stops at each place of articulation in comparison to having only two. In these senses the English stop system has the advantage not only of being the stop system of a majority language but also of being less marked. Furthermore, this change involves relaxation of laryngeal tension, a phenomenon reported in linguistic change in other languages, e.g. Proto-Semitic to Arabic (Martinet 1959: 93-6; Heselwood 1996: 32-4).

Fig. 2a. The set of realisations of voiceless stops is properly contained within the set of realisations of voiced stops; consequently, distinctiveness is unidirectional.

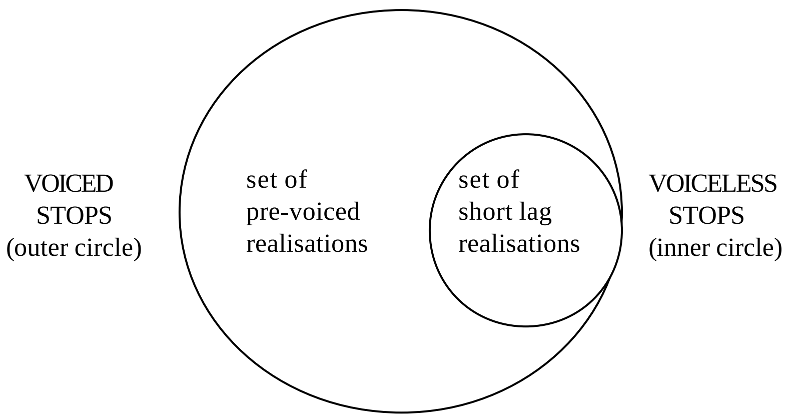
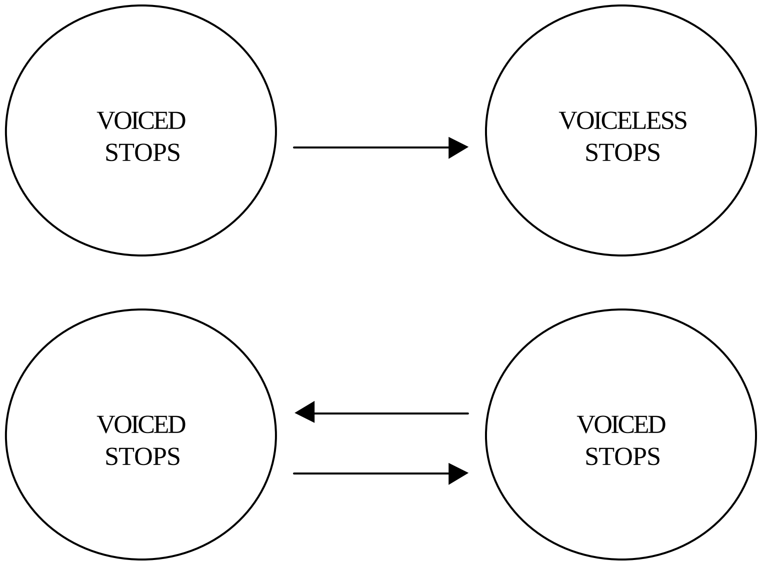


Fig. 2b. Unidirectional (upper) and bidirectional (lower) distinctiveness. In unidirectional distinctiveness one term of the opposition is distinct with respect to the other but not

vice versa; in bidirectional distinctiveness both terms are distinct with respect to each other. For a discussion of this and related issues see Dickins (1998: 90-98).

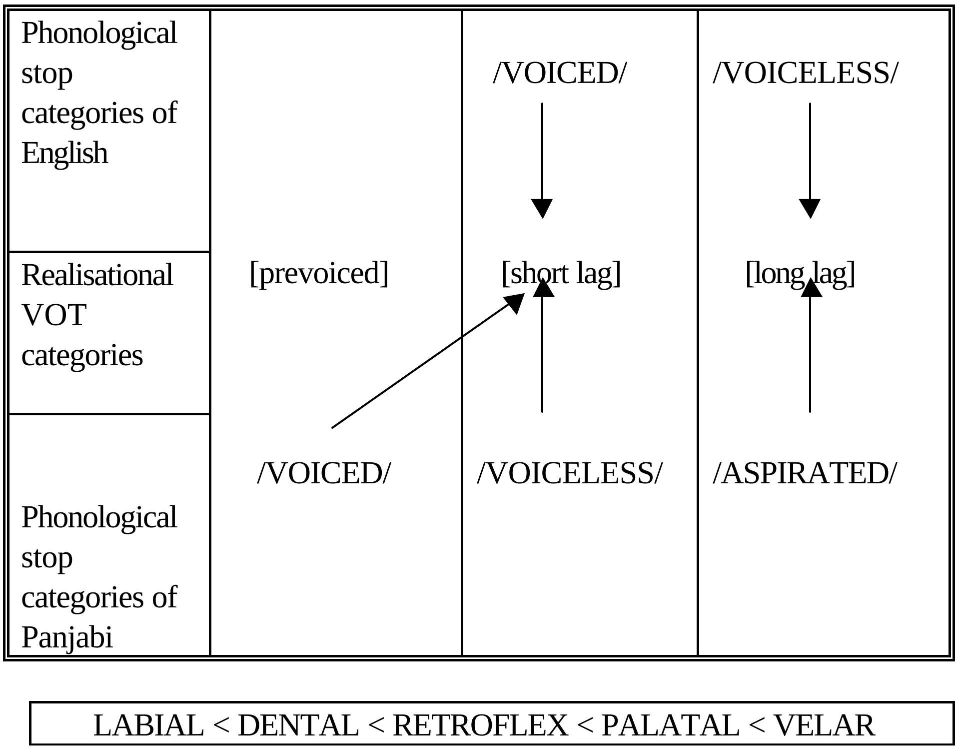


If the younger generation speakers are producing Panjabi voiced stops in the same way that they produce English voiced stops then we have an example of 'phonetic overlap' between the two speech codes (Gumperz 1974: 261) in which the allophones of the minority language appear to have been replaced by those of the majority language despite the fact that the minority language is the first language for these speakers. In speech processing terms we can see this as the activation of motor programmes for the realisation of Panjabi stops which were originally formulated, and are still being used, for realising English stops. Our samples indicate that speakers will in fact activate sometimes a Panjabi-type motor programme and sometimes a more English-type one when speaking Panjabi in the same setting, for example all those speakers with a mixture of prevoiced and devoiced realisations of voiced stops. Further research is required to see if indeed the VOT values of devoiced Panjabi stops are similar to the same speakers' realisations of English voiced stops, and if so whether patterns of motor programme activation correlate with speakers' social and linguistic attitudes and behaviours.

It needs to be remembered that our data were not culled from samples of spontaneous speech; we might expect even more extensive deviation from the expected pattern, that is, more devoicing, in spontaneous speech compared to the citation forms elicited in the picture-naming task (Hewlett, Gibbon & Cohen-McKenzie 1998: 164-5).

All in all, then, we are suggesting that a phonologically important change appears to be in progress in the realisation of Panjabi voiced stops amongst younger generation speakers in Manningham, that this change is being shaped by influence from the phonetics of English voiced stops, possibly aided by the less marked nature of the English stop system, and that a vocal tract effect is evident which facilitates this influence in stops with occlusions nearer the glottis and inhibits it in stops with more anterior articulations (see Fig. 3).

Fig. 3. Devoicing causes re-assignment of Panjabi voiced stops to the short lag VOT category resulting in a pattern that mirrors English. The closer the place of articulation is to the glottis, the greater the probability of this taking place. (The results have been extrapolated to cover retroflex stops for which no data were collected.)



It is, however, important to state that the loss of a VOT category does *not* logically entail the loss of a phoneme category. It is possible that all or some of these speakers may use other phonetic parameters to maintain the triadic stop oppositions of Panjabi. Although investigation of this is beyond the scope of this study, we have noted that some speakers in all three groups may be using burst amplitude as a cue to distinguish voiced and voiceless stops. In groups A and B this is in addition to VOT, but in groups C and D the VOT difference, as we have discussed, is often not present.

9. The sociocultural dimension

Studies have shown that when a group of speakers of a language migrate and settle amongst speakers of another language linguistic changes are likely to take place which will differentiate them from those speakers who remained behind. Furthermore, many of these changes are likely to be due to the influence of the language spoken in the area of settlement (see e.g Comrie 1981: 197-203). Our data are consistent with this insofar as the expected VOT pattern for Panjabi appears not only to be in the process of breaking up in Manningham Mirpuri Panjabi due to extensive devoicing but also to show signs of re-forming in line with the expected VOT pattern for English stops (compare Tables 1 and 11, and see Fig. 3). Our analyses indicate that, within our sample, this is only happening in younger speakers who have acquired Panjabi in Manningham,[3] an environment in which English is the language of the wider social, political and economic context both within the city of Bradford and in the UK as the nation state. What we may be seeing here is evidence that younger speakers of Mirpuri Panjabi - the minority language - are showing preferences for a feature of the dominant majority language. This would be consistent with a number of previous studies of language attitudes among younger minority language speakers in analogous socioeconomic contexts (Day 1982), though as Day points out there are important methodological problems in assessing and interpreting attitudinal data, one of them being the context in which the data are collected. In our case, although we were collecting non-attitudinal data, collection of group C data took place in an interactional setting characterised partly by language crossing (Rampton 1998) and this may have subtle influences on pronunciation. While the collection of group D data itself did not involve language crossing, it did take place in a school in which the dominant language, and the language of instruction, is English.

It is important therefore not to read too much into our results in terms of language attitudes. Without careful sociolinguistic research based on larger amounts of data collected in different communicative settings we can offer no general conclusion on the nature or extent of the influence of English pronunciation on the pronunciation of Mirpuri Panjabi in Manningham, nor can we draw inferences regarding how our group C and group D speakers and their peers perceive English as the majority language and their relationship to it. As Day (1982: 127) reminds us, evidence of preferences for features of a majority language does not mean that the minority language is not highly valued by its speakers. Furthermore, caution should be exercised in taking evidence of *influence from* the majority language as evidence for *preference for* it. Insofar as languages, and features of languages, are tools of social negotiation, using a particular tool in a particular social context may not mean it is preferred beyond that context.

Finally, we need to raise the question, although we cannot answer it, as to whether we are witnessing in the devoicing of voiced stops a symptom of language shift from Panjabi to English, or the creation of a new set of voiced stop variants which will characterise Bradford Mirpuri Panjabi for some time to come.

References

Abramson, A.S. (1977). Laryngeal timing in consonant distinctions. *Phonetica* **34**. 295-303.

Bhatia, T.K. (1993). *Punjabi*. London: Routledge.

Bradford Education (1996). *Manningham in Context*. Bradford Education Policy and Information Unit.

Catford, J.C. (1977). *Fundamental Problems in Phonetics*. Edinburgh: Edinburgh University Press.

Comrie, B. (1981). *Language Universals and Linguistic Typology*. Oxford: Blackwell.

[3] We unfortunately have no data from young speakers in Mirpur.

Davis, K. (1994). Stop voicing in Hindi. *Journal of Phonetics* **22**. 177-193.
Day, R.R. (1982). Children's attitudes towards language. In Ryan, E.B. & Giles, H. (eds.) *Attitudes Towards Language Variation*. London: Edward Arnold. pp.116-131.
Dickins, J. (1998). *Extended Axiomatic Linguistics*. Berlin: Mouton de Gruyter.
Gimson, A.C. (1980). *An Introduction to the Pronunciation of English.* London: Edward Arnold.
Grimes, B.F. (ed)(1996). *Ethnologue*. Summer Institute of Linguistics.
Gumperz, J.J. (1974). Linguistic and social interaction in two communities. In Blount, B.G. (ed.) *Language, Culture and Society.* Cambridge, Mass.: Winthrop.
Heselwood, B. (1996). Glottal states and emphasis in Baghdadi and Cairene Arabic: synchronic and diachronic aspects. In Dickins, J. (ed.) *Three Topics in Arabic Phonology*. Centre for Middle Eastern and Islamic Studies, Occasional Paper No.53, University of Durham. pp. 20-44.
Hewlett, N., Gibbon, F. & Cohen-McKenzie, W. (1998). When is a velar an alveolar? Evidence supporting a revised psycholinguistic model of speech production in children. *International Journal of Language and Communication Disorders* **33**. 161-176.
Kenstowicz, M. (1994). *Phonology in Generative Grammar*. Cambridge, Ma.: MIT Press.
Kim, C-W. (1970). A theory of aspiration. *Phonetica* **21**. 107-116.
Ladefoged, P. & Maddieson, I. (1996). *The Sounds of the World's Languages.* Oxford: Blackwell.
Laver, J. (1980). *The Phonetic Description of Voice Quality.* Cambridge: Cambridge University Press.
Lisker, L. & Abramson, A.S. (1964). A cross-language study of voicing in initial stops. *Word* **20**. 384-422.
Martinet, A. (1959). La palatalisation 'spontanée' de *g* en arabe. *Bulletin de la Societé de Linguistique de Paris* **54**. 90-102.
Masica, C.P. (1991). *The Indo-Aryan Languages.* Cambridge: Cambridge University Press.
Ohala, J.J. (1997). The relation between phonetics and phonology. In Hardcastle, W.J.& Laver, J. (eds.) *The Handbook of Phonetic Sciences.* Oxford: Blackwell. pp. 674-694.
Rampton, B. (1998). Language crossing and the redefinition of reality. In Auer, P. (ed.) *Codeswitching in Conversation*. London: Routledge. pp. 290-317.
Stuart-Smith, J. & Cortina-Borja, M. (in press). A preliminary investigation of tone in 'British' Panjabi. In Abbi, A. (ed.) *Proceedings of the XVIIIth South Asian Languages Analysis Roundtable.* Delhi: Motilal Banarsidass.
Stubbs, M. (ed.)(1985). *The Other Languages of England: Linguistic Minorities Project.* London: Routledge & Kegan Paul.
Tolstaya, N.I. (1981). *The Panjabi Language*. London: Routledge & Kegan Paul.

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Appendix 1. Words elicited in the picture-naming task.

LABIAL

b	bʊd	*Wednesday*
p	pʊl	*bridge*
pʰ	pʰʊl	*flower*

DENTAL

d̪	d̪al	*Arabic letter-name*
t̪	t̪ala	*lock*
t̪ʰ	t̪ʰali	*plate*

PALATAL

dʒ	dʒana	*going*
tʃ	tʃabi	*key*
tʃʰ	tʃʰap	*ring*

VELAR

g	ganda	*dirty*
k	kan	*ear*
k^h	k^halta	*standing*

Appendix 2. VOT values for group A subjects.

pv = prevoiced; dash = missing value. Age of speaker given in left hand column.

	b	p	p^h	d	t	t^h	dʒ	tʃ	tʃ^h	g	k	k^h
MY	pv	28	48	pv	20	53	pv	41	97	pv	34	64
43	pv	30	63	pv	34	48	pv	53	77	pv	33	-
PS	pv	39	61	pv	28	78	pv	45	102	pv	36	78
48	pv	25	78	pv	19	53	pv	41	106	pv	27	80
TA	pv	30	78	14	17	55	39	44	102	pv	41	77
49	pv	25	89	19	20	67	28	28	82	28	39	66
KB	pv	27	80	pv	10	75	pv	42	116	pv	36	45
36	pv	23	81	9	19	44	pv	45	92	pv	33	53
MA	pv	28	47	pv	28	84	pv	55	97	pv	44	72
27	pv	0	52	pv	38	56	pv	72	130	pv	55	50
AZ	pv	30	73	pv	45	61	pv	80	111	pv	53	89
35	pv	0	92	pv	38	73	pv	67	113	pv	50	69
MB	pv	27	81	pv	-	73	pv	72	136	pv	47	108
38	pv	30	98	pv	-	88	pv	72	125	pv	47	102
DA	pv	19	83	pv	13	69	pv	30	127	pv	22	48
34	pv	13	89	pv	13	58	pv	47	78	pv	27	39
MT	pv	19	69	pv	22	47	pv	38	92	pv	36	66
30	pv	27	72	pv	19	67	pv	41	64	pv	34	70
SK	pv	11	75	pv	27	55	pv	47	63	pv	30	63
30	pv	0	88	pv	31	52	pv	48	90	pv	38	55

Appendix 3. VOT values for group B subjects.

	b	p	p^h	d	t	t^h	dʒ	tʃ	tʃ^h	g	k	k^h
RT	pv	22	88	pv	16	70	pv	70	152	pv	38	98
30	pv	31	73	pv	27	73	pv	58	164	pv	31	61
PH	pv	38	100	pv	25	108	pv	71	111	pv	36	92
33	pv	34	91	pv	22	89	pv	55	117	pv	42	89
FN	pv	0	91	pv	22	40	pv	59	91	pv	33	64
34	pv	17	59	pv	20	72	pv	59	98	pv	33	64
SD	pv	44	102	pv	27	58	pv	63	95	pv	28	58
32												
AH	pv	36	66	pv	11	56	pv	42	159	pv	35	67
32	pv	30	94	28	28	72	pv	52	158	pv	52	84
IM	pv	42	59	pv	19	41	pv	48	84	pv	30	41
34	pv	27	66	23	27	39	pv	58	83	pv	44	59
TK	pv	33	95	pv	27	63	pv	53	106	pv	41	63
26	pv	25	84	pv	14	85	45	44	88	pv	34	56
AY	pv	22	78	pv	14	64	pv	39	66	pv	27	55
27	pv	23	92	pv	20	69	30	44	94	pv	28	52
HA	pv	20	63	pv	19	63	pv	44	94	pv	28	52
28	pv	20	58	pv	19	78	pv	50	91	pv	-	77

Appendix 4. VOT values for group C subjects.

* = discounted value (see text).

	b	p	p^h	d	t	t^h	dʒ	tʃ	$tʃ^h$	g	k	k^h
SZ	pv	*83	84	pv	*77	80	pv	73	109	pv	31	73
21	-	-	-	-	-	-	-	-	-	-	-	-
JB	27	*84	-	pv	23	78	45	45	95	27	30	80
12	23	*50	-	pv	16	95	45	47	106	25	34	71
WS	23	*69	81	0	16	81	42	55	83	30	34	72
21	20	*81	-	20	09	70	38	56	89	28	34	72
ZH	27	*96	98	33	*73	73	42	41	70	25	34	42
22	0	*81	92	pv	*88	95	pv	52	125	27	23	44
SQ	23	36	61	27	27	56	54	58	109	33	33	69
12	-	-	-	22	28	91	42	38	92	45	28	83
SA	pv	32	77	13	13	89	48	91	94	31	28	66
16	pv	-	-	-	-	-	39	44	97	22	30	81
RZ	pv	16	67	pv	16	80	pv	98	106	28	28	64
16	pv	22	92	23	19	100	62	87	94	31	31	57
SM	pv	16	107	pv	17	92	64	53	106	31	31	84
19	pv	23	134	pv	22	94	44	61	145	41	36	66
SB	pv	14	52	-	20	120	pv	39	83	pv	20	68
18	pv	15	64	-	14	77	48	52	77	pv	23	66
ND	pv	34 -	75 -	17	20 -	- -	pv	45	91	pv	36	61
18	-			17			pv	45	83	31	34	73

Appendix 5. VOT values for group D subjects.

	b	p	p^h	d	t	t^h	dʒ	tʃ	$tʃ^h$	g	k	k^h
AJ	9	25	72	28	25	34	47	56	138	25	34	66
	13	47	75	31	25	34	28	72	153	28	*59	69
AM	pv	*97	173	13	16	55	pv	70	94	25	31	73
	16	*86	102	pv	19	89	pv	47	94	22	33	58
AR	pv	17	*25	20	22	92	pv	81	225	27	48	36
	31	-	64	16	25	105	88	61	131	33	41	36
AS	pv	*81	78	pv	22	28	pv	67	108	pv	30	64
	pv	-	106	27	23	59	pv	41	98	pv	30	59
AY	23	*69	66	pv	14	38	pv	42	73	19	16	*27
	pv	22	*39	pv	14	19	pv	28	78	5	33	*39
NG	0	0	47	13	9	44	53	44	63	25	28	63
	0	25	*31	13	13	56	31	31	63	22	28	59
SM	44	*78	81	9	9	6	50	53	78	31	34	84
	0	*91	94	9	9	9	38	69	138	22	-	72
MB	pv	*88	69	16	16	17	38	44	67	pv	20	42
	pv	*75	70	14	20	13	pv	39	81	19	30	47
YN	pv	18	142	17	6	64	49	*83	78	pv	39	78
	6	61	113	20	16	79	56	42	114	39	23	60
SR	pv	44	89	7	27	41	38	39	191	44	31	47
	pv	25	70	23	30	28	39	42	67	27	31	41
ZA	19	20	84	13	25	117	42	*95	83	31	38	66
	pv	14	63	23	17	64	39	*102	102	33	41	67
AK	pv	*72	84	11	13	*14	pv	36	84	pv	28	58
	pv	19	119	pv	9	75	28	44	81	42	39	48
TK	20	22	113	pv	17	77	48	66	98	23	20	-
	pv	21	89	pv	16	88	pv	56	97	pv	25	-
II	pv	pv	134	19	28	109	pv	*106	128	31	47	100
	pv	pv	144	pv	*116	91	pv	*128	163	pv	44	88
AN	0	21	66	pv	0	56	pv	41	94	pv	25	41
	pv	0	75	pv	13	53	44	25	88	pv	41	53
SN	pv	117	78	pv	39	197	pv	52	177	pv	23	89
	30	134	80	pv	25	58	48	56	-	pv	27	89
ST	38	28	86	pv	13	84	41	83	123	pv	27	53
	16	27	86	pv	11	67	pv	53	134	25	45	63
SI	pv	17	88	pv	17	113	41	39	80	19	41	56
	pv	23	91	pv	16	59	pv	36	72	27	22	44
TG	17	34	66	pv	24	59	pv	45	84	34	56	28
	pv	50	100	22	23	53	55	56	100	33	30	58