First accent acquisition: a study of phonetic variation in child-directed speech

Dominic Watt[†], Gerry Docherty[‡] and Paul Foulkes[*]

† University of Aberdeen, UK ‡ University of Newcastle upon Tyne, UK * University of York, UK

e-mail: d.j.l.watt@abdn.ac.uk, g.j.docherty@ncl.ac.uk, pf11@york.ac.uk

ABSTRACT

The findings discussed in this paper emerge from a project focused on the speech of 40 English children aged between 2 and 4, the chief aim of which was to track the path taken by children in learning variable phonetic forms in their acquisition of the accent of their immediate community. We present initial results from an analysis of the linguistic input the children receive from their mothers, focusing on realisations of (t) in child-directed speech. This material revealed differential patterns in mothers' speech depending on the sex and age of the child addressee.

1. INTRODUCTION

The results reported here derive from a project entitled *The Emergence of Structured Variation in the Speech of Tyneside Infants* (ESV), the aim of which was to track the process of acquisition of variable phonetic forms among 2-4 year infants in Tyneside, England.

A pre-existing study of adults from Newcastle, which we label PVC (for *Phonological Variation and Change in Contemporary Spoken British English*) yielded a detailed account of phonological variation and change in that speech community [3,4,6], and provided important information about patterns of variation in inter-adult speech (IAS) in the child subjects' immediate community. The goals of our project also required insight into patterns of variability in child-directed speech (CDS) among the mothers of the children recorded for the ESV study. While it is known that the properties of CDS may differ qualitatively and quantitatively from those of IAS (for example, intonation patterns and speaking rate vary markedly between CDS and IAS), segmental properties of CDS have hitherto not been the focus of much attention. Exceptions are [7], which found increased phonological 'reduction' in CDS, and [1], which suggests that features of CDS may change according to a child's age. Existing literature often concludes that modifications made in CDS are intended to help children to learn language, one aspect of which is that CDS is relatively simplified compared with IAS [5,8]; Snow [8], for instance, claims that CDS represents 'a cleaner, simpler corpus from which to learn language' (p.180). Thus, one element of ESV was to investigate the properties of CDS in Tyneside English and to compare these to what we know about IAS within the same speech community, and to our observations of the children's emerging speech performance.

2. BACKGROUND

The focus in the present research was on the phonetic variants of (t) in word-medial and word-final pre-vocalic contexts, since it is known that (t) in these contexts displays complex sociolinguistic patterning among Tyneside adults. It was hypothesised that the distribution of (t) variants in CDS would differ from that in IAS, and that this might reflect an effort on the part of mothers to present children with a simplified version of the pattern found in IAS, as per the view of CDS propounded by Snow and others. A second hypothesis concerned patterning by age: although the ESV children were substantially younger than those in [1], we considered it possible that speech addressed to younger children might differ with respect to the distribution of (t) variants from that directed at older ones. Furthermore, we hypothesised that the CDS corpus might exhibit differences between the speech of boys' mothers and that of girls' mothers, such that (t) variants are used in different proportions depending on the child's gender. So as to estimate the difference between IAS and CDS among the ESV mothers, we used (t) data drawn from the samples for 4 young working-class women in the PVC corpus as a baseline (see below), since these speakers live in the same neighbourhoods, and are closely comparable to the ESV mothers in terms of social characteristics.

3. METHODS

3.1 Informants

	age				
	2;0	**2;6**	**3;0**	**3;6**	**4;0**
boys	4	4	4	4	4
girls	4	4	4	4	4

Table 1: cross-sectional study sample design (all ages ± 1 month)

The fieldwork for the ESV project comprised two parallel informant samples. First, 40 children and their caregivers were located to fulfil a cross-sectional design structured according to the children's age. The sample design is shown in Table 1. The second strand of the study followed a number of children longitudinally across part or all of the same age range. All informants were drawn from the same

ISBN 1-876346-48-5

broadly 'working class' neighbourhoods that were investigated in the PVC study. The criteria for selection were (a) that both parents were monolingual English speakers; (b) that the child was born at full term and had otherwise normal development (as reported by the parents); (c) that s/he had normal hearing, no recurrent *otitis media*, and no referrals for speech and language therapy; (d) that s/he was the eldest or only child, so as to minimise the potential impact of communication with siblings. In all cases the mother was the main caregiver. The fieldwork yielded a total of 96 recordings from 53 children.

3.2 Data elicitation

Fieldwork was carried out by a team of experienced speech and language therapists. Recordings were made in surroundings as quiet as could be achieved at the subjects' homes, using Trantec radio lapel microphones and a Sony TCD-D10 Pro II digital tape recorder, and typically lasted around 30 to 45 minutes. The principal material collected was a sample of play-based interaction between mother and child, mediated by the fieldworker. Activities centred on a book and a bag of toys brought by the fieldworker, the contents of which were chosen to elicit words containing phonological variables of interest.

3.3 Data analysis

Data analysis involved of a combination of acoustic and auditory methods. Auditory analysis was used to record unitary transcriptions using IPA symbols, and was supplemented by acoustic analysis using Sensimetrics *SpeechStation 2*. Acoustic analysis was used both to register measurements of key parameters (e.g. voice onset time) and also to compile a detailed profile of the acoustic properties found in each token.

The acoustic profiling for (t) recorded the presence or absence of features including: (a) **periodicity** during the stop (reflecting voicing); (b) **release burst** (reflecting release of an oral closure); (c) **creaky phonation** (the main acoustic correlate of 'glottal' variants in this dialect [4]). All tokens were analysed where possible. Over 3,000 were collected from mothers engaged in CDS. A small number of tokens was also collected from fathers/other adult males who participated in a small minority of the recording sessions; these figures are included in the results shown in section 4 for the purposes of comparison with CDS produced by mothers.

The data reported in the present article are drawn from the mothers in the cross-sectional study. One recording proved unsuitable for analysis, and therefore our main CDS corpus consists of speech from 39 mothers. The effects identified as significant in the paper are based on a range of statistical analyses. In the adult-centred project, variation in phonological variables with respect to social variables was analysed using log-linear models. Statistical analyses of the ESV data included χ^2 comparisons, linear regression models, and the identification of disjoint 95% confidence intervals for the proportion of use of the phonological variants for different subgroups of the whole population.

3.4 Phonological contexts

Variability in (t) was analysed in four phonological contexts: word-initial (e.g. *tap*), word-final pre-pausal (e.g. *cat*##), word-medial (WM, e.g. *water*), and word-final pre-vocalic (WFPV, e.g. *get off*). The last two contexts provided especially high levels of variability in (t) realisation in the mothers' CDS, and the results reported in section 4 deal only with (t) in these contexts.

3.5 Phonetic variants

Tyneside English exhibits two main variant types of (t) in WM position: a standard-like voiceless stop [t], and a range of laryngealised forms, all of which are characterised by a period of creaky phonation and which usually but not always involve a simultaneous oral occlusion. We label this variant category 'glottals'. Full glottal stops are, however, very rare and the majority of glottal tokens are best transcribed [t̰]. These two variant types also occur in WFPV contexts, although two others regularly occur. The first is the rhotic approximant [ɹ], the distribution of which is lexically restricted to words such as *get*, *what*, *not*, etc., while the second we label [t̪] as a cover symbol for variants which are voiced but not glottalised (e.g. [ɾ]).

4. RESULTS

4.1 (t) in WM position

Figure 1 shows the distribution of (t) variants in WM contexts in (from left to right) IAS as used by the young working-class PVC women (N = 163), CDS produced by the 39 ESV mothers (N = 570), and for comparison, CDS produced by 3 ESV fathers/other male speakers (N = 36).

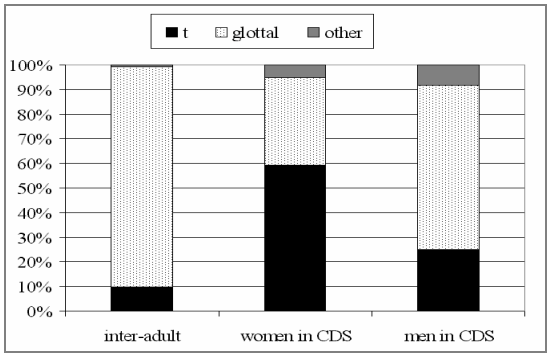

Figure 1: Use of (t) variants in WM position (%)

Striking differences are apparent between IAS and the CDS used by the mothers. In CDS the proportion of [t] increases to an average of 59%, contrasting with the average 10% used in IAS. Use of glottals drops from 90% to just 36% in CDS. χ^2 comparisons show this difference to be highly significant ($p <<< .001$). Furthermore, the gender and age of the children being addressed using CDS are shown to

have a highly significant effect on variant distribution. Mothers of girls used [t] significantly more often than did mothers of boys (χ^2; p <<< .001), while glottals were used much more commonly by mothers of boys than mothers of girls, as shown in Table 2.

	[t]	glottals	N
mothers of boys	48	45	293
mothers of girls	70	28	277

Table 2: Use of (t) variants in WM position, by gender of child (%).

The age/gender analysis was refined further using linear regression analysis. Use of [t] showed an inverse correlation with child age. Specifically, [t] was less frequent in speech to the 4;0 cohort of children than for other groups (p = .02) and to a lesser extent among the 3;6 group, the effect narrowly missing significance at the 5% level. Glottal usage was significantly higher among mothers of children in the 4;0 age group (p = .03), and narrowly missed significance at the 5% level for the 3;6 group (p = .052).

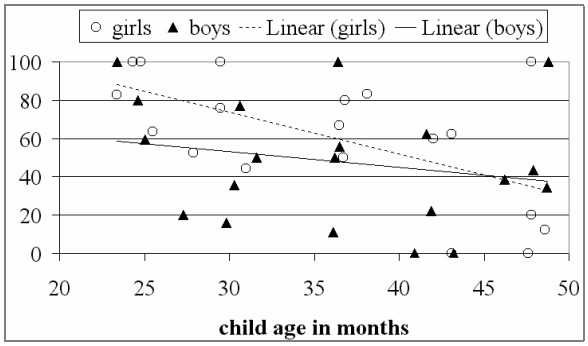

Figure 2: Use of [t] in CDS, WM context, by child age and gender (%).

The age-related effect is, however, largely attributable to performance among girls' mothers. CDS addressed to girls aged 4;0 contained significantly less [t] than did speech to girls in other age groups (p = .02), while for the 3;6 mothers [t] was also relatively infrequent (p = .06). Glottal usage was highest among these mothers (p = .02 for the 4;0 group, p = .04 for the 3;6 group). In contrast, no significant effect was found among mothers of boys, showing that their variant usage remained relatively stable across the age range. The trend among boys' mothers was nonetheless similar to that found among the mothers of girls. These patterns are demonstrated in Figure 2.

In summary, it appears that usage of the variants of (t) in WM position in CDS is (a) different from that found in IAS in this variety, in that standard [t] is far more frequent than in IAS; (b) variant usage is affected by child age, but more markedly for mothers of girls, with [t] usage decreasing in line with an increase in glottal usage; (c) child gender affects usage, in that speech to boys contains more glottals and less [t] than does CDS to girls, especially among younger children.

4.2 (t) in WFPV position

1,128 tokens of (t) in CDS were analysed in this context. The distribution (this time for female speakers only) of the four variants discussed in section 3.5 is shown in Figure 3.

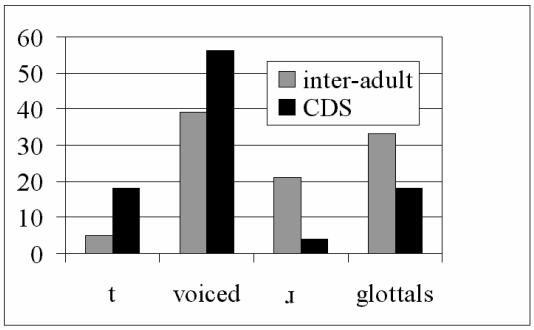

Figure 3: Use of (t) variants in WFPV position (%)

The trends apparent in Figure 3 parallel those found for WM context. CDS is characterised by lower frequencies of [ɹ] and glottals as compared with the IAS informants, who displayed higher use of local variants and lower use of more standard variants than was the case for CDS used by the ESV mothers. [t] is consequently more frequent, as are the voiced variants (χ^2 tests show all four effects to be significant, with p <<< .001 in each case).

A significant effect was again found for child gender with respect to use of [t] (p = .04). Though this variant was fairly infrequently used, it was used twice as frequently in speech to girls as in speech to boys. No significant effects emerged for the other variants, but, as was observed in WM context, the relative scarcity of [t] in speech addressed to boys was compensated for by increased frequency of glottals and [ɹ].

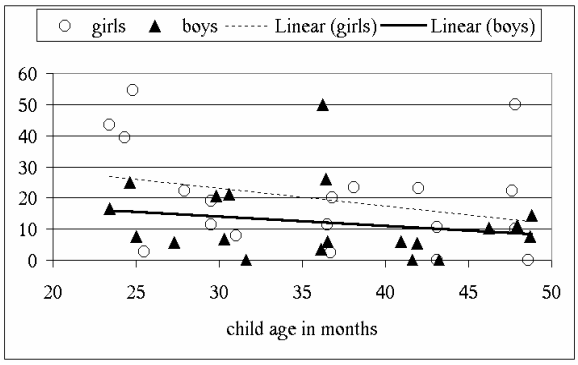

Figure 4: Use of [t] in CDS, WFPV context, by child age and gender (%).

With regard to child age, no significant effects emerged in analysis of voiced variants, glottals or [ɹ], but usage of [t] was again found to be significantly lower in CDS directed at 3;0 and 3;6 children than was the case for other age cohorts. Figure 4 displays the data for [t] variants by child age and gender, and gives clear indication that overall

ISBN 1-876346-48-5

levels of [t] usage are higher in speech to girls. With respect to age the picture is less clear, although as indicated by the trend lines there is a general lowering from left to right, with the difference between boys' mothers and girls' mothers being greatest in the youngest cohort. [t] usage, then, declines in line with an increase in child age, while the difference with respect to gender is greatest for the young children.

To summarise the findings for (t) in WFPV position: (a) variant usage in CDS again differs from that in IAS, in that [t] is more frequent while [ɹ] and glottals are less frequent; (b) variant usage is influenced by the gender of the child, with less [t] in CDS to boys than in CDS to girls; (c) [t] usage is influenced by child age, with CDS to younger children containing more [t] than that addressed to older children, and the gender-correlated difference being most marked for the youngest cohort. The fairly high degree of variability in the mothers' data means we should be cautious in our interpretation of the WFPV results, but nonetheless the general trends apparent in the data are persuasive, and consistent with those found for WM context.

5. SUMMARY AND CONCLUSIONS

The results in both contexts revealed three main patterns. First, there are clear differences in variant choice according to whether the addressee is an adult or a child. CDS generally contains more [t] and fewer vernacular variants than does IAS. Secondly, variant choice in CDS is constrained by the gender of the child being addressed, with speech to girls typically containing more [t] than speech to boys, where vernacular variants are more abundant. Thirdly, this gender effect is more marked for younger children. (A fourth pattern, whereby adult males seem to make fewer segmental modifications in CDS than adult women do, is suggestive, but is based in the present case on rather scant data).

Our findings indicate, then, that sociolinguistic values may need to be taken into account when assessing the motivation behind parental choices in CDS, and in making claims about the value of CDS for the acquisition process. The patterns shown in Figures 1 and 3, for instance, indicate that while mothers may modify their speech in such a way that use of localised and stigmatised variants in CDS is reduced relative to IAS (and to CDS as used by males in the WM data), these variants are nonetheless still used, such that if anything CDS is *more* variable in this respect than is IAS. The (t) patterns in the mothers' CDS may therefore represent a strategy by which, in combination with providing children with general lexical contrastive information, mothers are able to demonstrate to their children the range of possible phonetic variants used in the community, and thereby to aid them in developing awareness of the contextual and social-indexical significance of each variant type (see [2] for discussion). Furthermore, the ESV mothers tailor the CDS they use in line with the gender and age of the child, such that younger children receive CDS more gender-differentiated than do older children, while the increasing age of a child correlates with a decrease in the use of the standard [t] form in CDS directed at children of both sexes. We suggest that the gender/age interaction is indicative of the role of CDS as a means of socialising children into their speech community through the transmission of speech forms considered appropriate to a child's gender.

Research focussing on comparisons of the infants' and mothers' performance, on CDS used by Tyneside mothers of boy/girl twins, and on other phonological variables (consonantal and vocalic), is ongoing, as is analysis of data drawn from adults in the longitudinal sample. We also intend to make further investigations of adult males' CDS patterns.

ACKNOWLEDGMENTS

This research was funded by the UK Economic and Social Research Council (grant numbers R000234892 and R000237417). We are grateful to Barbara Dodd, Lesley Milroy, Jenny Tillotson and the fieldworkers Catherine Ashcroft, Mike Caygill, Alison Geall, Marion Hall, Jennifer Smith and Debbie Vigil for their contributions, and to Tom Chadwick of the University of Newcastle Department of Statistics for advice on statistical matters.

REFERENCES

[1] A. Cruttenden, "Phonetic and prosodic aspects of baby talk," in *Input and Interaction in Language Acquisition*, C. Gallaway and B. Richards, Eds., pp. 135-52. Cambridge: Cambridge University Press, 1994.

[2] G.J. Docherty, "Speaker, community, identity: empirical and theoretical perspectives on sociophonetic variation," this volume.

[3] G.J. Docherty, P. Foulkes, J. Tillotson and D. Watt, "On the scope of phonological learning: issues arising from socially structured variation," submitted for *Papers in Laboratory Phonology 8*, S.R. Anderson, C.T. Best, L. Goldstein and D.H. Whalen, Eds. Berlin: Mouton de Gruyter, forthcoming.

[4] P. Foulkes, G.J. Docherty and D. Watt. "The emergence of structured variation," *University of Pennsylvania Working Papers in Linguistics*, vol. 7, pp. 67-84, 2001.

[5] C. Gallaway and B. Richards, Eds., *Input and Interaction in Language Acquisition*, Cambridge: Cambridge University Press, 1994.

[6] L. Milroy, J. Milroy and G.J. Docherty, *Phonological Variation and Change in Contemporary Spoken British English,* Final report to the UK Economic and Social Research Council, grant R000234892, 1997.

[7] L. Shockey and Z.S. Bond, "Phonological processes in speech addressed to children," *Phonetica*, vol. 37, pp. 267-274, 1980.

[8] C.E. Snow, "Issues in the study of input: finetuning, universality, individual and developmental differences, and necessary causes," in *The handbook of child language*, P. Fletcher and B. MacWhinney, Eds., pp. 180-93. Oxford: Blackwell, 1995.