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ABSTRACT

The frequencies and co-occurrence distributions of some of the prosodic features in the speech of children are discussed. The emphasis is on the determination of systems and structure of non-segmental lectal variability in the children's speech without primary reference to function. The primary data consisted of selected episodes of connected speech from six Tyneside (England) children, three boys and three girls, aged 4.7 to 5.9 years. The episodes are all taken from tape-recordings in naturalistic settings in the children's homes. The system of analysis that was used treats prosodic features organized into independent, but interacting systems. The discussion of the research treats: (1) some of the similarities in the children's speech by examining details of the tone units which they realize: (2) some of the more important differences between the frequency distributions of nuclear tones in localized Tyneside and non-localized speech: and (3) overlapping representations of tonic frequency distributions among the children. The study showed that it is possible to establish significant patterns of variation in the non-segmental systems of a number of children. It has shown patterns of development towards localized intonational systems and indicated some important non-linguistic co-variates of intonational structure. (AMH)

MODELLING INTONATIONAL VARIABILITY IN CHILDREN*

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In recent years sociolinguistic variability in the speech of adults has received considerable attention from linguists. However, almost nothing of consequence is known of how children acquire and develop the sociolinguistic skills and patterns of sociolinguistic variability which have been observed and reported for adult speakers.

It is important that these sociolinguistic skills and their acquisition by children should be studied. Firstly such studies can contribute to our understanding of the nature of linguistic variability and of the change of variable systems through time. Secondly such studies are crucial to our knowledge and understanding of the relationships between language, socialisation and social behaviour.

If children are to become competent speakers of their language it is obvious that they must acquire mastery not only of linguistic form and structure, but also of the 'rules' for the appropriate use of that form and structure. They need to become 'sociolinguistically competent'. They need to learn how and when to use which particular variety of their language and to be able to interpret other speakers' use of different varieties of their language; they must learn how to handle competently linguistic variability.

This paper will explore the structure and functioning of linguistic variability in children's speech by focussing on some aspects of non-segmental phonological variation in the speech of a small number of children.

Structure and Functioning of Non-segmental Variability

The importance of non-segmental variability to speakers and hearers in interaction has been well documented. A speaker can use variations in the distribution of non-segmental features to communicate to a hearer his attitudes (Pike, 1945; Uldall, 1964), to draw a hearer's attention to those stretches of an utterance to which the speaker ascribes particular informational importance (Halliday, 1967; Hultzen, 1959), and to delimit the syntactic interpretation of an utterance (Crystal, 1969; Halliday, 1967; Stockwell, 1960). Consequently a speaker can marshal the variable resources of non-segmental phonology to 'frame' his utterances (cf. Goffman, 1975). That is, prosodic and paralinguistic features can be used to indicate which of

a range of speech acts is intended by a speaker at a given point in an interaction; these features encode much of the illocutionary force of utterances (Searle, 1969). Non-segmental features thus assist the hearer to recover, in part, speaker intent.

If children are to become 'sociolinguistically competent' it is important that they learn such 'framing' functions of non-segmental systems in order that they may appropriately project their intentions and adequately interpret the intentions of others. Children must thus acquire control over at least one kind of variability exhibited by non-segmental systems - control over what we may call 'variability of domain' (cf. Pellow and Jones, 1978). 'Variability of domain' refers in a straightforward way to the location and extent of non-segmental features with respect to other co-occurring (segmental, lexical, syntactic) features of speech. For example, a speaker can choose to produce a tone unit of one word, one clause, or a number of clauses. He may decide that a loudness feature will have as its domain one syllable or twelve syllables. The choices that a speaker makes in the organisation of such variability allow him to project the kinds of linguistic, social and affective 'information' referred to above.

As well as exhibiting variability in terms of the domains of realisation, non-segmental systems also vary 'lectally'. There is a growing literature which indicates clearly that non-segmental systems exhibit regional and social variation which parallels that documented for segmental systems, lexis and syntax. Different varieties (of English, certainly) may, for instance, vary in respect of their inventories of nuclear tone (tone types and relative tone frequencies) and in respect of the co-occurrence of particular non-segmental features with each other and with other levels of linguistic structure (Knowles, 1974; Pellowe and Jones, 1978; Vanderslice and Pierson, 1967; Jarman and Cruttenden, 1976). This paper will be concerned with an examination of this latter kind of non-segmental variability (lectal variability) in the speech of children.

Research concerned with language acquisition and that concerned with sociolinguistics has, on the whole, paid remarkably little attention to the non-segmental features of speech. (Given the range of 'information' which non-segmental features can project, this relative lack of attention is more than a little surprising.) Little is known in detail about the structure of non-segmental variability in children's speech. In general, where the non-segmental features of children's speech have been considered in the literature, attention has been focussed on function rather than on structure (Dore, 1973; Halliday, 1975; Lewis, 1936; Montgomery, 1978).

The present paper is an attempt to redress the balance somewhat. I will present and discuss the frequencies and co-occurrence distributions of some of the prosodic features in the speech of a number of children. The emphasis will be on the determination of systems and structure of non-segmental lectal variability in the children's speech without primary reference to function.

There are two important motivations for this enterprise. First we require such information in order to establish the extent to which it is possible to effect (socio)linguistic comparisons between children in terms of their non-segmental behaviour. Second we require such information before we can hope to determine the range of functions and 'social' information which

can be projected by particular (co-occurrent) prosodic and paralinguistic features.

As I will show, analysis of the speech data from the children in such terms indicates that it is possible to determine some significant patterns of non-segmental (lectal) variability in their speech. The burden of this paper, then, is exploratory rather than definitive.[1]

Data Base; Characteristics of Speech Samples

The primary data which will be discussed here consists of selected 'episodes' of connected speech from six Tyneside children. These episodes were abstracted from a larger corpus collected over the period of about one year. The episodes are all taken from tape-recordings in naturalistic settings in the children's homes. This data will, at various points in the discussion, be supplemented with that from further samples deriving from tape-recordings of other Tyneside children and non-localised (standard English speaking) children recorded in similar situations.[2]

The episodes were selected from the longer recordings in an attempt to establish comparability across a similar range of interactive situations and a variety of interactants as well as to be representative of the speech of the children. It was felt necessary that a variety of speaking activities be sampled on the assumption that if the realisation patterns of prosodic and paralinguistic features undergo changes in different kinds o interaction (cf. Crystal and Davy, 1969; Local, 1978) then sampling only one kind of talk from the children could seriously limit the generality of the findings. A decision was taken to use for the present purposes of analysis episodes which were similar in the following respects: (i) interactant involved - adults, siblings, peers; (ii) settings involved - living room of child's home, bathroom, child's bedroom. At each of the 'stages' discussed below every effort was made to analyse roughly equal amounts of data involving the full range of interactants and variety of settings just outlined. The samples at each stage, thus, are composed of approximately equal proportions of talk to parents, to other adults (including investigator), to siblings and peers.

Such considerations as these, however, placed some restrictions on the amount of data which was available for analysis for the various children (different homes do not conduct their daily routines in the same way). The speech data for any child then, at any particular 'stage', can vary from 25 minutes to 45 minutes of tape-time.

Details of the six children speakers and some characteristics of the speech samples are given in Table 1.

All the six children had been born and had lived continuously in the Tyneside area (although some of the families had moved within that area).

The label 'stage' is used here for convenience of identification only and carries no theoretical weight in this exposition. The 'stages' indicated by digits alone were the first samples to be selected from the total corpus

Table 1

Claire	(stage 1)	5.0 yrs	960 Tone Units; mean words per TU 2.3
	(stage 1a)	5.3 yrs	981 TU's; mean words per TU 2.3
	(stage 2)	5.6 yrs	1002 TU's; mean words per TU 2.5
	(stage 2a)	5.8 yrs	1023 TU's; mean words per TU 3.0
	(stage 3)	5.10 yrs	993 TU's; mean words per TU 3.0
Angela	(stage 1)	4.11 yrs	897 TU's; mean words per TU 2.0
	(stage 1a)	5.2 yrs	966 TU's; mean words per TU 2.4
	(stage 2)	5.5 yrs	985 TU's; mean words per TU 2.3
	(stage 2a)	5.7 yrs	764 TU's; mean words per TU 2.8
	(stage 3)	5.9 yrs	911 TU's; mean words per TU 2.8
Cath	(stage 1)	4.7 yrs	886 TU's; mean words per TU 2.0
	(stage 1a)	4.10 yrs	1011 TU's; mean words per TU 2.4
	(stage 2)	5.0 yrs	892 TU's; mean words per TU 2.4
	(stage 3)	5.7 yrs	925 TU's; mean words per TU 2.9
Paul	(stage 1)	4.9 yrs	952 TU's; mean words per TU 2.1
	(stage 1a)	5.0 yrs	831 TU's; mean words per TU 2.4
	(stage 2)	5.2 yrs	1061 TU's; mean words per TU 2.3
	(stage 2a)	5.4 yrs	767 TU's; mean words per TU 2.8
	(stage 3)	5.6 yrs	1056 TU's; mean words per TU 2.8
Peter	(stage 1)	5.0 yrs	926 TU's; mean words per TU 2.5
	(stage 1a)	5.2 yrs	703 TU's; mean words per TU 2.5
	(stage 2)	5.4 yrs	901 TU's; mean words per TU 2.5
	(stage 2a)	5.6 yrs	958 TU's; mean words per TU 2.8
	(stage 3)	5.8 yrs	887 TU's; mean words per TU 3.1
James	(stage 1)	5.1 yrs	890 TU's; mean words per TU 2.4
	(stage 1a)	5.3 yrs	1020 TU's; mean words per TU 2.3
	(stage 1b)	5.5 yrs	7787 TU's; mean words per TU 2.6
	(stage 2)	5.7 yrs	853 TU's; mean words per TU 2.9

of each child's speech to represent three roughly equally spaced intervals during the recording period. Those stages designated 'la, 2a' were later drawn from the total corpus to fill out intermediate periods of the child's language development (again at roughly equal intervals) and to check on the directionality of some of the apparent changes which were observed in the children's language during the analysis of the initial stages. Two further points require clarification. There are only four stages given for James as the recording period was curtailed when his parents moved away from the Tyneside area. The same is true for Catherine; however here the stage 3 sample was taken from recordings made after the family had moved out of the Tyneside area.

Analysis of Non-segmental Features:

The system of analysis of non-segmental (intonational) features employed in this paper derives from that devised by Crystal (Crystal and Quirk, 1964; Crystal, 1969). The essence of this system is that it treats prosodic features as being organised into independent, but interacting systems.

Although the samples of the children's speech were transcribed and analysed in terms of the full range of prosodic and paralinguistic features discussed in Crystal (1969), I shall only be concerned here with an examination of the system of nuclear tone (but see Local, 1978; Local, in prep.). The system of nuclear tone analysed here is that discussed by Crystal (1969). It is represented by the following basic terms: fall, rise, level, fall-rise, rise-fall, fall plus rise, rise plus fall. Nuclear tones are viewed as kinetic pitch glides/jumps or sustentions (e.g., level tone). Everything else which differs in terms of pitch height may be described by reference to the system of 'pitch-range'. (Elements in the pitch-range system are described according to the nature and degree of the relationship between the pitch of the syllable under consideration and that of the previous syllable.)

Tone Unit Characteristics and Sociolinguistic Variation

As a preliminary to the examination of the non-segmental behaviour of the six Tyneside children, I shall consider some of the similarities in their speech by examining details of the tone units which they realise.

The definition of tone units offered by Crystal (1969, 207) will be assumed here without further discussion: 'Minimally, a tone unit must consist of a syllable and this syllable must carry a glide of a particular kind'. Only complete tone units are admitted here for consideration.

Some similarities between the children and some of the changes which take place in their speech during the recording period can be seen if we consider Figures 1 to 6. These figures give the percentage distribution of tone unit lengths in the speech of the children for the first and last stages sampled, measured in institutional words.

The distribution of tone lengths shown here is remarkably similar for the children, as are the patterns of change in frequencies of tone units of different lengths. In this latter respect there is a clear trend for the children at the latest stage sampled to realise more tone units of greater length. This trend is more obvious for Claire, Peter and Paul than it is for the other three children. Only James is atypical in this respect in terms of these samples. (This may be connected with the fact that when James' speech was first sampled he was older than any of the other children at that stage.) James is also atypical in that the modal value (the point of maximum distribution) for tone unit length in his speech changes from one to two words in the period sampled. For the other children it remains at one word per tone unit (although there is a fall in the percentage of those tone units which are realised as one word).

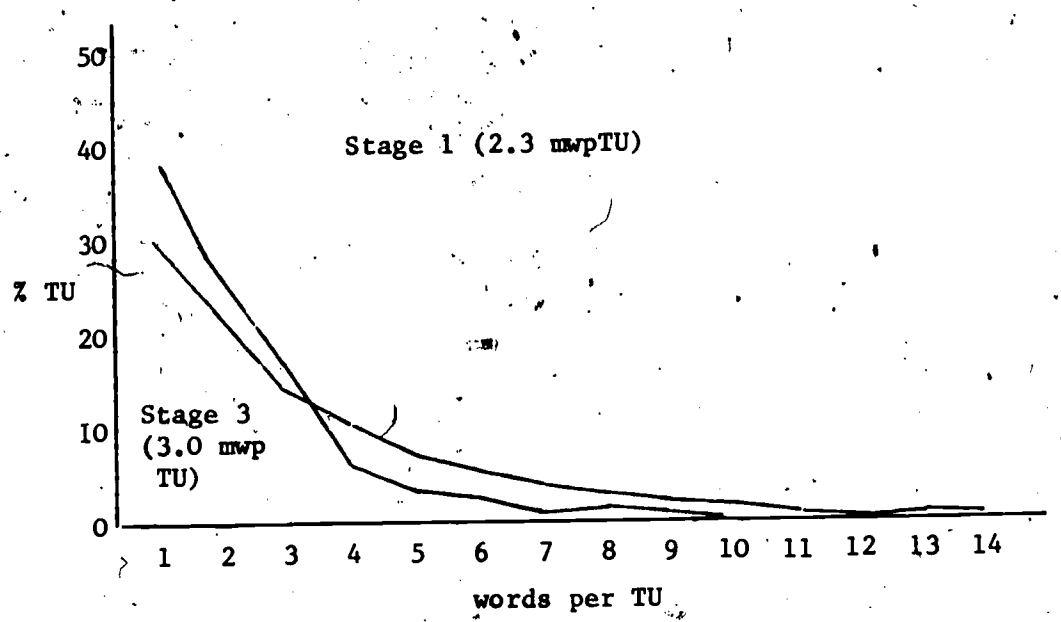


Figure 1: TU distribution - Claire

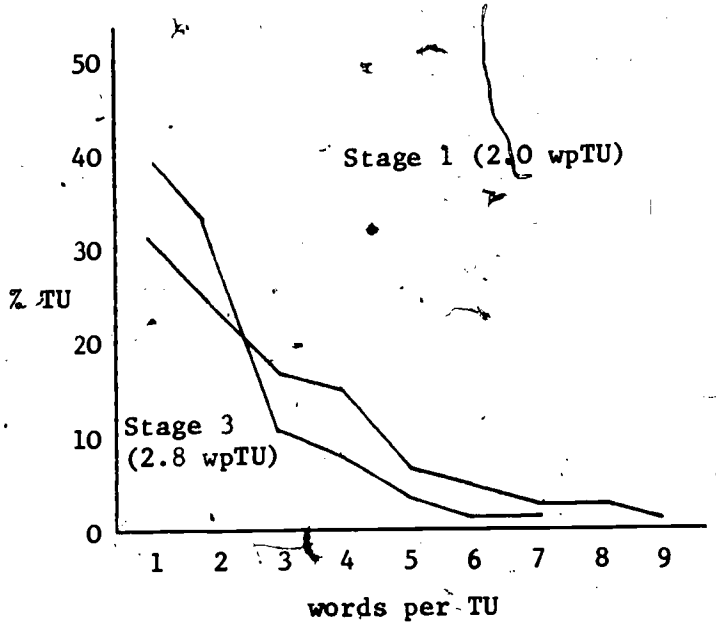


Figure 2: TU distribution - Angela

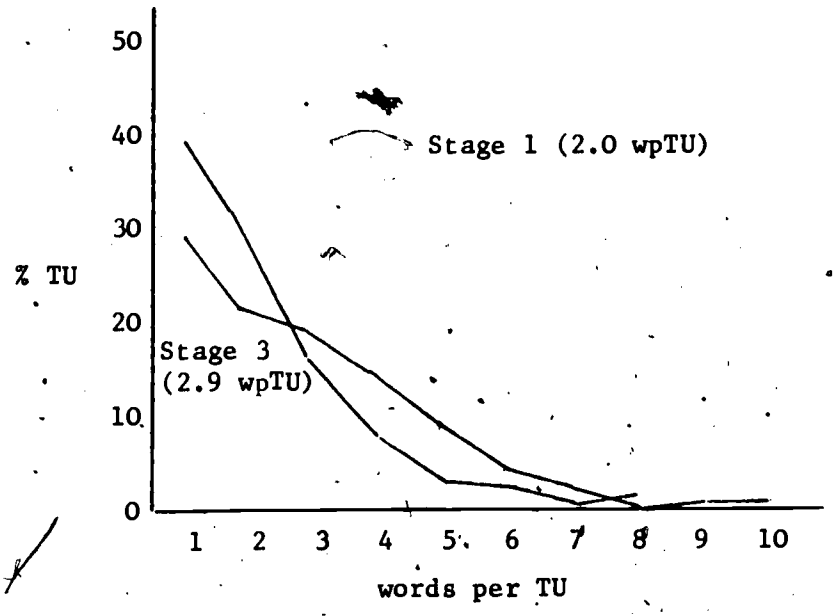


Figure 3: TU distribution - Cath

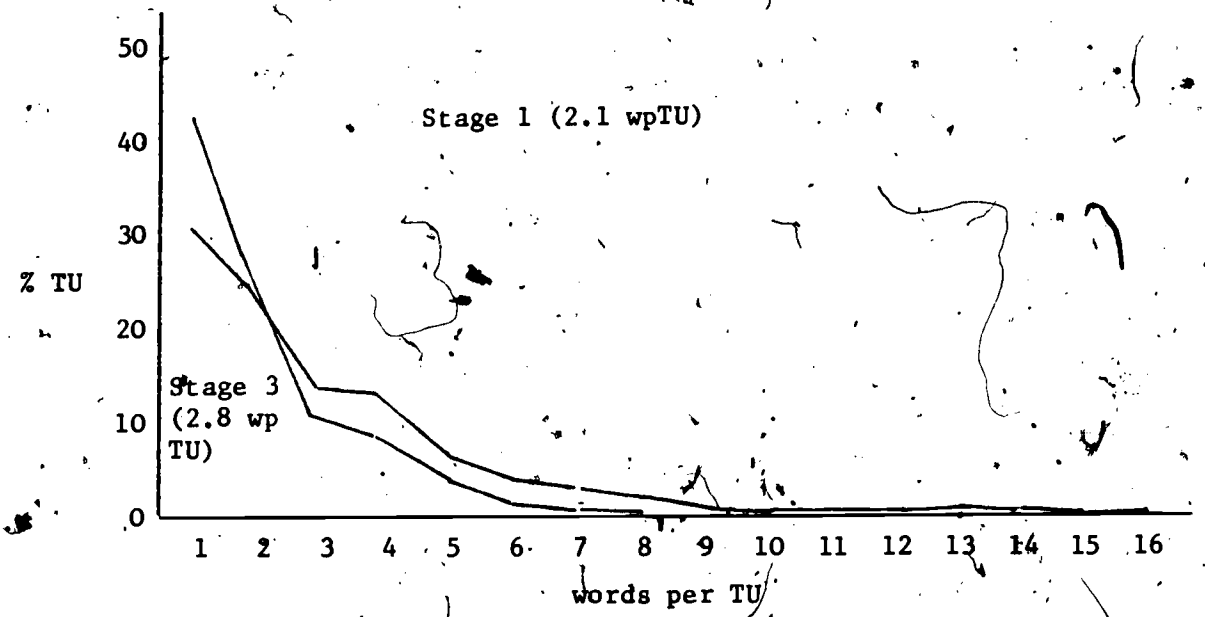


Figure 4: TU distribution - Paul

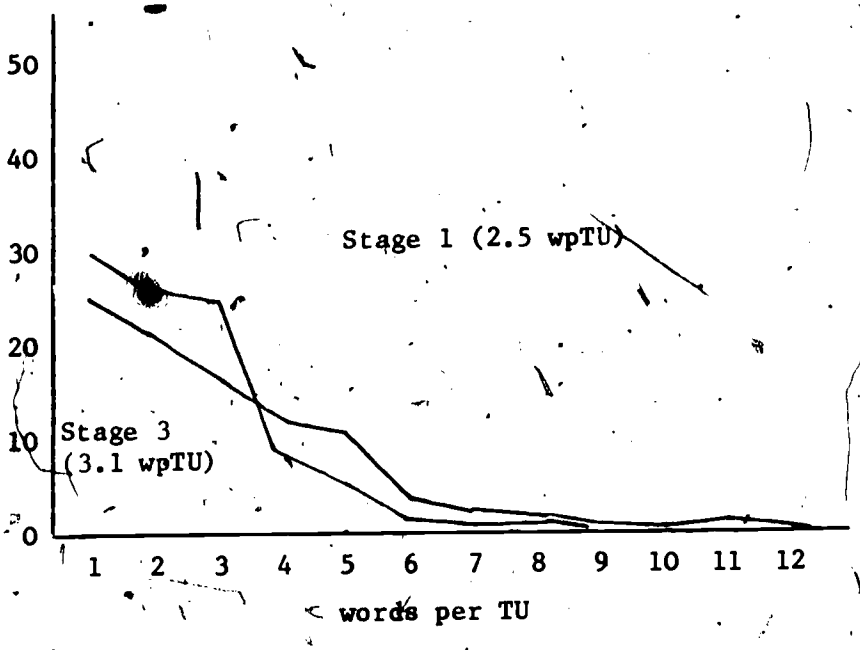


Figure 5: TU distribution - Peter

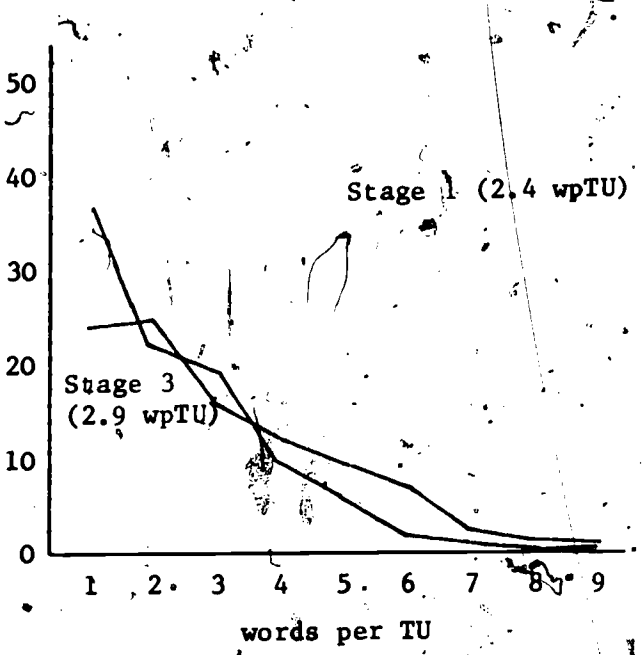


Figure 6: TU distribution - James

The two measures - mean words per tone unit, which increases for all the children over the period studied, and the modal value - probably yield two kinds of information: information concerning the stage of linguistic maturity which the children have attained, and also information relating to the kind of talk which makes up the samples. With respect to the first kind of information we can compare these results with those obtained for the speech of another child (Barnaby - not reported here in detail - growing up on Tyneside, probably acquiring a minimally localised variety). Barnaby, aged 3:8 years when recorded, was found to have a mean tone unit length of 1.4 words and a mode of one word for over 90% of tone units in his speech. We can also compare the results reported by Quirk et al. (1964) who, in their investigation of prosodic-grammatical correspondences in adult speech, found for their sample a mean tone unit length of 5.3 words. In addition, Pellowe (1970) in a comparative study of localised Tyneside speakers found a mean tone unit length of 6.1 words. When compared with the Quirk sample, however, this difference was found to be not significant, the mode for the two samples being 4 words per tone unit for 15-17% of tone units.

The relatively high figures for mean words per tone unit and modal value for the Quirk and Pellowe samples may, however, be a function of the kinds of interaction which those samples represent: relatively formal speaking situations (this is particularly so in the case of the Quirk sample which is described as coming from speakers in 'panel discussion'). Calculation of mean word per tone unit and of mode for the (rather more) natural speech (conversations and monologue) in Crystal and Davy (1969; 1970) yields rather lower figures. Mean words per tone unit ranges between 2.9 and 3.5 for the various speech data, while the mode for all the talk in these sources is one word per tone unit for about 30% of tone units. This is clearly an area where much more information for a variety of different kinds of interaction is required before we can say with certainty what a valid interpretation of the figures might be.

Nonetheless, Pellowe's observation that for adults '... length of tone unit ... will not serve as a differentiating criterion between localised and non-localised varieties' (1970:5) would appear to be true also for the children considered here. The speech of six other children, resident on Tyneside, but who spoke (like their parents) non-localised varieties of English, was sampled at two points during a year when their ages were roughly comparable with those of the Tyneside children at the first and last stages sampled (see Table 1). The group mean values for mode and mean words per tone unit for the two samples (localised and non-localised children) were calculated. The mean age of the group of non-localised children at the first stage sampled was 4.11 years, that of the localised Tyneside children at the same stage was 4.8 years. At the latest stage sampled the non-localised children had a mean age of 5.8 years, while the Tyneside children had a mean age of 5.6 years. The modal values for the samples treated as groups was one word per tone unit. The values for mean words per tone unit for the localised Tyneside children was 2.2 and 2.9, and for the non-localised children was 2.4 and 2.8 for the two stages. An analysis of variance performed on these data indicated that no significant relationships existed between either the sex, socioeconomic class or 'localisation' of the children and mean words per tone unit. However, there was a highly significant relationship between age and mean words per tone unit for all the children ($df = 15$, $F = 13.389$, $p < .001$).

While mean length of tone unit and modal value may not diagnose differences between localised and non-localised varieties, there do appear to be some non-linguistic correlates of tone unit length for both the localised and non-localised children considered here.

Through all the stages analysed, the children exhibit an obvious tendency to produce longer tone units when interacting with adults than they do when interacting with siblings or peers (cf. the findings of Marhlew et al., 1978, and Shatz and Gelman, 1973, some of whose findings directly parallel this observation). An examination of tone units longer than four words in the children's speech, through all the stages considered here, reveals that 69% occurred in interaction with adults. To give one specific example: Claire at stage two spoke 67% of tone units longer than four words exclusively when talking with adults. Of the remaining 33% of such utterances in her speech 14% occurred during interaction with her younger sister while she (Claire) was telling a story to her and her mother; a further 8% of these tone units occurred in speech again to her sister while she (Claire) was engaged in playing the roles of nurse and teacher. These activities involved the adoption by Claire of an obviously 'adult' role of superior status, where she ordered Angela about, instructing her what to do and generally organising the direction which the play was to take.

The age of the children interacts with this variation of tone unit length and interlocutor. As the children get older relatively less of the longer tone units occur in speech with adults. To take Claire again as an example: at stage three she realises only 51% of such tone units in speech to adults (for more details of such variability see Local, 1978, and Local, in prep.).

Structure of Non-segmental Variation. Variable Structure in Tonic Frequencies. Changes in Tonic Frequencies through Time.

In order that the structure of non-segmental variation in the children's speech be clearly understood, we begin by characterising some of the more important differences between the frequency distributions of nuclear tones in localised Tyneside and non-localised (adult) speech. Pellowe (1970) and Pellowe and Jones (1978) showed that it is possible to distinguish between variant intonational systems in terms of the gross percentage distribution of particular tone types. Figure 7 pictures such differences and shows the gross percentage distribution of each tone in two samples. Plotted against the frequencies for Quirk's (1964) sample are the mean values for the (randomly drawn) Tyneside sample discussed by Pellowe and Jones. This figure reveals that there are considerable differences in the relative frequencies of falls, rise-falls and levels between the two samples. These differences can be regarded as being diagnostic of lectal differences which discriminate between the two types of speech variety.

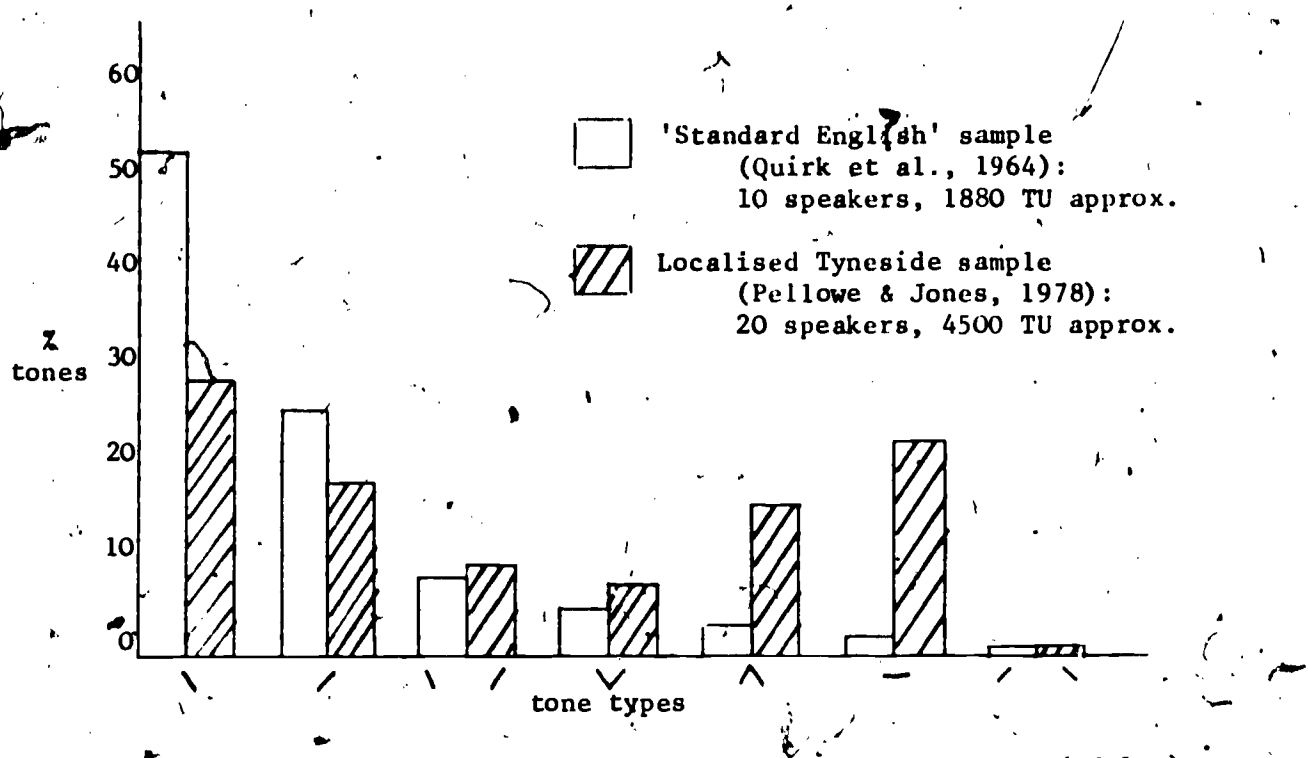


Figure 7: Gross Percentage Distribution of TONES for two samples (adults)

Figure 8 presents similar gross percentage frequency distributions for the nuclear tones for four samples: the Quirk sample (SA = 'standard speaking' adults); mean values for the sample of six non-localised children (SC = 'standard speaking' children) at the latest stage sampled; mean values for the sample of six localised Tyneside children (TC) at the latest stage sampled; and for the Pellowe and Jones sample (TA = 'Tyneside adults').[3]

A number of points obtrude:

1. There are clear similarities between the non-localised adults and the non-localised children. T-tests performed on these samples indicate that significant differences ($p < .001$) are only to be located in the relative proportions of rise plus fall, and fall plus rise tones in the two samples.

2. There are clear similarities between the localised Tyneside adults and localised Tyneside children. T-tests performed on these samples reveal that significant differences ($p < .001$) are to be located only in the relative proportions of fall plus rise and rise-fall tones in the two samples. (In addition there is a significant difference ($p = .028$) between the frequency of rise plus fall tones in the two samples).

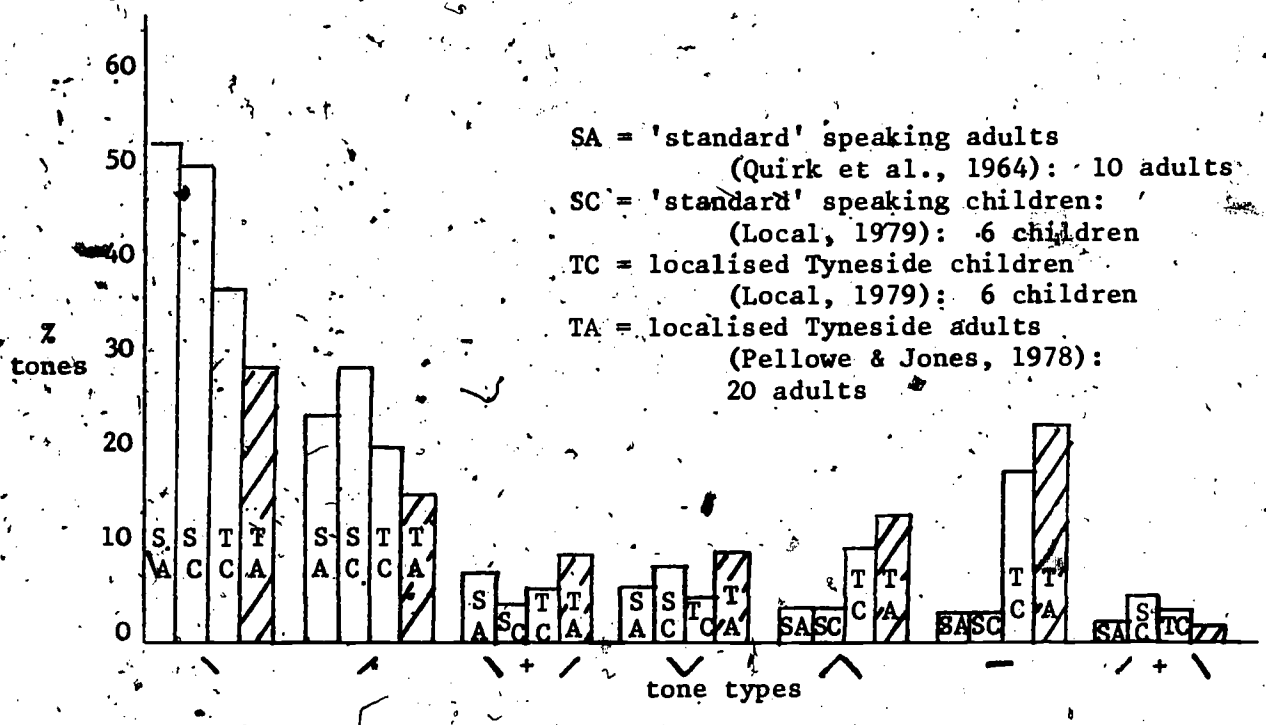


Figure 8: Gross Percentage Distribution of TONES for four samples (adults and children)

3. There are obvious differences between the non-localised and localised Tyneside children in terms of the relative tonic frequencies. T-tests reveal that there are highly significant ($p < .0001$) differences in the relative fractions of falls, rises and levels, levels and rise-fall tones in the two samples. It is important to note that the differences between the SC and TC samples are not simply to be located in the differences between absolute frequencies of particular tones, but also in the ratio of one tone to another. We find, for instance, that there is a significant difference between the SC and TC samples (and also between the SA and TA samples) which can be expressed in terms of the percentage difference between falls and rises in the samples. The Tyneside samples (both children and adults) have a significantly smaller percentage difference between falls and rises than do the S samples (adults $p < .0001$; children $p < .001$). (All samples show a greater frequency of falls than rises.)

These differences and similarities between the children and adult samples provide substantial evidence that the localised and non-localised children are acquiring rather different variant intonational systems.[4] Before considering in detail the implications of these differences and similarities, it is worth pointing out that although the individual members of each sample show (often considerable) differences of tonic distribution (cf. Table 2 for such details for the Tyneside children), these differences are not random (see Pellowe and Jones (1978)), and further discussion below).

Another general point which requires some comment is the overall similarity between the means of the Tyneside adult and Tyneside children's samples. The similarities between these two samples are of some interest in the light of the rather different nature of the interactive situations from which they are drawn. (The same observation is relevant for the non-localised adult and children samples.) The Tyneside adult sample represents speech occurring during the course of an informal, loosely structured interview, while the Tyneside children's sample, as has been indicated, derives from a range of different kinds of interaction in naturalistic situations surreptitiously recorded. One might have expected such different circumstances to have affected such non-segmental dimensions as frequency of tone type (cf. my comments above). That such differences of interactive purpose do not appear to be reflected in the gross percentage distribution of tone-types in these samples is therefore of some interest. Most plausibly, I think, we can argue that although the realisation of patterns of prosodic (and paralinguistic) features are likely to change in different situations, frequency of tone-type enters into such changes only minimally (if at all). The major changes may well be in terms of other co-occurrent prosodic systems and in the variable dependencies between such systems. That is, any modifications in terms of the system of nuclear tone which do arise from or are related to, differing interactive purposes are not such as would cause obvious perturbations to the localised system of tone characterised by the overall percentage distribution of particular tone types (e.g., modifications may be achieved in different interactive circumstances by widening or narrowing of the nucleus, by the differential co-occurrence of certain pitch-range features with nuclei, or by variable location of the nucleus with respect to lexical items (see Local, 1978)).

I turn now to a detailed consideration of the significance of some of these differences in tonic frequency in the speech of the Tyneside children. Table 2 presents, in quantified form, the changes which were observed in the relative frequencies of nuclear tone in the Tyneside children's speech over the period studied.

From these figures we can identify a number of general trends:

1. The most important changes take place in the relative frequencies of falls, rises, and level tones in the children's speech. (The changes which take place in the frequencies of these tones between the first and third stages sampled, for all the children except James, are highly significant ($p < .001$).)

2. For all the children there is a decrease in the frequency of nuclear falls in their speech throughout the period studied.

3. For all the children there is an increase in the frequency of nuclear levels in their speech throughout the period studied.

Table 2 Gross percentage distribution of TONES during stages sampled

		↘	↗	→	∧	↗↘	↘↗	∨	Miscellaneous
Claire:	(1)	53	25	5	6	5	3	2	1
	(1a)	50	29	7					
	(2)	48	19	11	7	6	4	4	1
	(2a)	39	35	11					
	(3)	31	39	12	4	2	5	6	1
Angela:	(1)	49	31	6	4	3	2	4	1
	(1a)	40	35	6					
	(2)	37	38	8	5	2	4	5	1
	(2a)	37	40	9					
	(3)	29	41	11	7	1	5	5	1
Cath:	(1)	51	30	8	4	3	2	1	1
	(1a)	44	34	7					
	(2)	42	39	8	4	1	2	3	1
	(3)	57	21	4	5	2	4	5	2
Paul:	(1)	55	25	5	7	5	1	1	1
	(1a)	54	23	6					
	(2)	48	12	15	10	8	3	2	2
	(2a)	44	12	25					
	(3)	35	13	26	9	3	6	5	3
Pete:	(1)	48	24	9	8	5	3	2	1
	(1a)	43	24	10					
	(2)	42	22	13	10	4	5	3	1
	(2a)	38	19	17					
	(3)	39	15	21	11	2	6	5	1
James:	(1)	36	19	25	9	3	3	3	2
	(1a)	35	19	26					
	(1b)	35	18	24					
	(2)	34	16	28	12	2	4	3	1

However, although it is possible to identify these general patterns of change, it is equally clear that the rates of change in relative frequencies of particular tones are not the same for all children, nor are the relationships between tones, or between the rate of change of particular tones.

I will explore the significance of the interactions of various tonic frequencies below, but first it is necessary to deal with one possible objection to the claim that these changes represent movements towards the acquisition of variant localised intonation systems.

One potential explanation for the changes in tonic frequencies presented in Table 2 could be that there are changes occurring in the co-occurrent syntactic structures used by the children. It could be argued, for instance, that the increase in rising tones as a proportion of all other tones in the girls' speech was a direct consequence of an increase in, say, the frequency

of a particular kind of interrogative structure. However, as Table 3 shows, this is not the case. Table 3 gives the mean percentages for four major classes of sentence-type in the Tyneside children's speech for the main stages sampled.

Table 3 Mean percentages for major sentence types in the speech of the six localised Tyneside children for the main 'stages' analysed

	Declarative	Imperative	Yes/No; Tag	Wh/other quest.
Claire	76 (2)	7 (1)	8 (1)	5 (2)
Angela	78 (4)	5 (2)	10 (2)	4 (1)
Cath	79 (3)	4 (2)	8 (1)	6 (3)
Paul	77 (3)	7 (5)	9 (1)	4 (2)
Peter	74 (4)	8 (3)	11 (2)	5 (2)
James	80 (2)	5 (1)	7 (3)	4 (2)

(The figures given in brackets represent the range of percentage scores for the sentence types. This gives us a gross measure of the variability of the frequency of the sentence type in any particular child's speech.)

As Table 3 indicates, while there is variation between the children in the overall frequency of particular sentence types, the changes through time for any one child are not very great. Statistical tests do not reveal significant changes in frequency here.

A rapid examination of the primary speech data for these children indicates what might have been adduced from Table 3. We find that particular tones, when they increase, take over the distribution of other tones with respect to the different sentence types. For example, the major part of the increased number of rises in the girls' speech are realised in places where previously falls (or sometimes level tones) would have been realised (e.g., statements, wh-questions). It is necessary to emphasise, moreover, that it does not appear to be that this redistribution represents a change in the uses to which particular structures are being put. It is not the case, for instance, that the statements which for the girls are increasingly realised with rises, fulfil the function of questions (i.e., this redistribution is not a consequence of 'speech act' differences in the children's speech). The redistribution is one consequence of the children's acquisition of localised intonational systems.[5]

Figures 9 - 11 explore pictorially the interactions and changing dependencies between the three major classes of tone (fall, rise, level) in the speech of the six Tyneside children (boys' stages encircled, girls' not).

Figure 9(a): Plot of % A on % difference

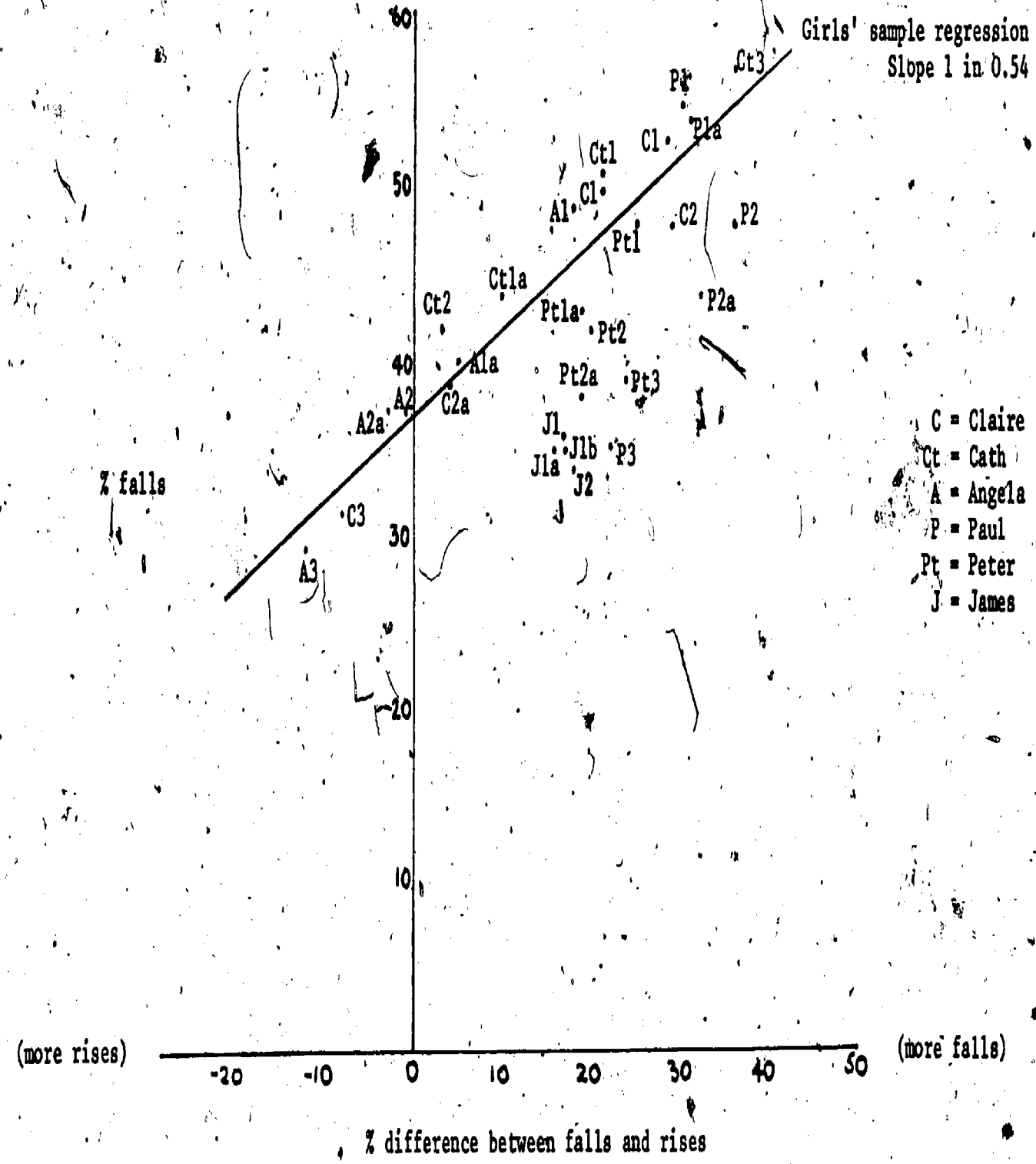


Figure 9(b): Plot of % / on % difference \,/

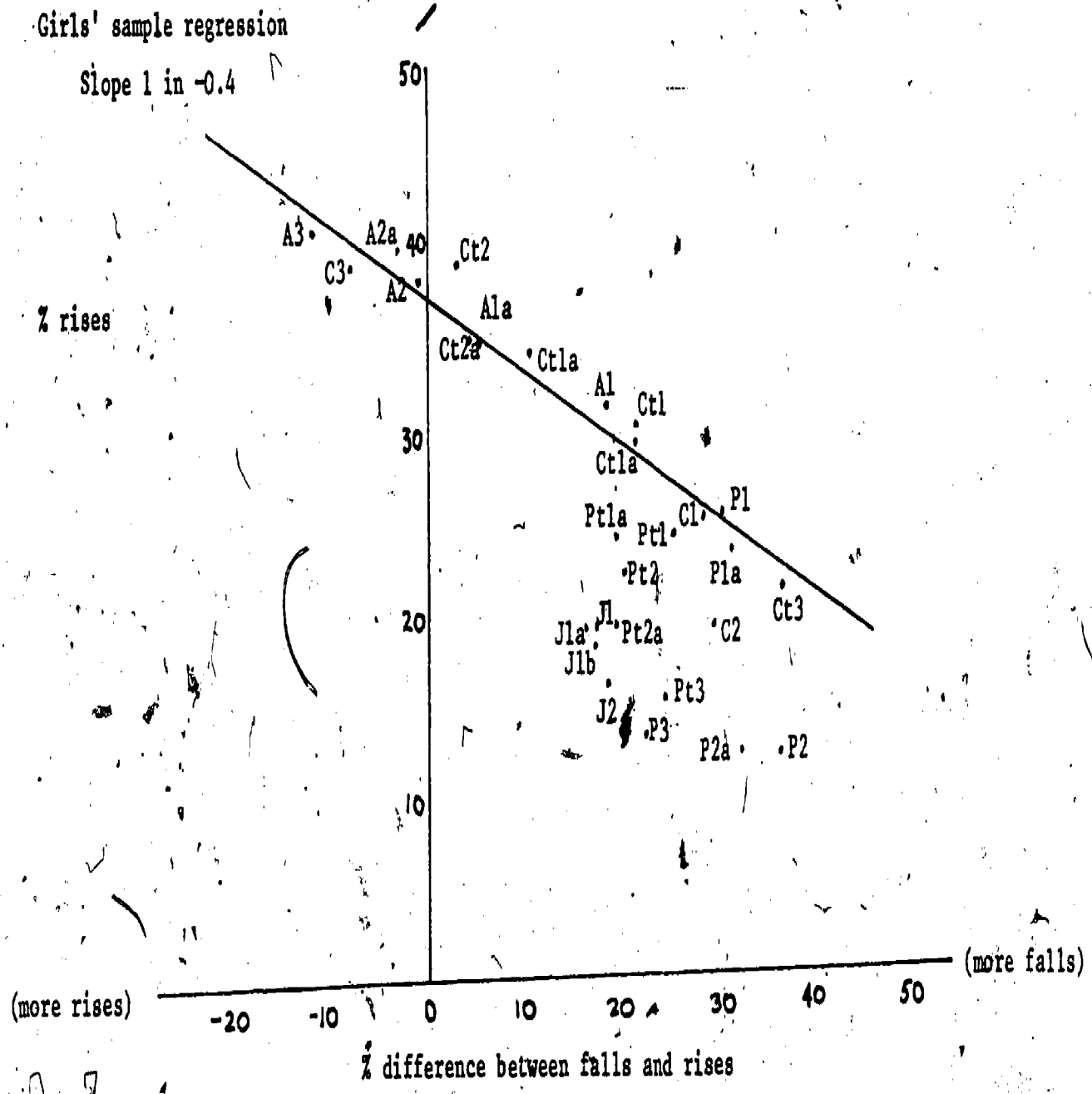


Table 4 Gross percentage distribution of FALL, RISE and LEVEL tone for the additional 12 localised Tyneside children.

				Age when speech sampled:
Janice:	30	26	10	6·0
	30	34	10	6·6
Kate:	34	21	9	6·8
	32	30	12	7·3
Anne:	34	24	10	6·10
	29	35	11	7·7
Eunice:	31	23	20	6·11
Judith:	28	26	19	6·11
Sheila:	23	31	15	7·3
Elaine:	20	28	19	7·5
Allan:	40	20	6	6·1
	31	15	28	7·2
Collin:	42	26	7	6·4
	39	18	23	6·8
Robert:	35	21	9	6·5
	30	16	25	6·10
Derek:	32	19	16	6·8
Keith:	40	13	19	6·1

These figures reveal something of the various courses which the children take to arrive at what resembles the adult-like localised Tyneside varieties pictured by Pellowe and Jones (1978). We can briefly characterise the intonation varieties of these children (and those of a further 12 localised Tyneside children) at the latest stage sampled as follows. There are three patterns of frequency distribution:

1. Pattern One: more falls than rises and more levels than rises (Paul, Peter, James, Collin, Robert, Allan)

2. Pattern Two: more falls than rises and more rises than levels (Keith, Derek, Cath, Eunice, Kate, Judith) (n.b., Cath has many more falls than any of the other children in this group, and considerably fewer levels).

3. Pattern Three: more rises than falls and more rises than levels (Claire, Angela, Sheila, Janice, Elaine, Anne).

I presented evidence earlier which showed that the relationship obtaining between the frequency of falling and rising tones might serve to differentiate localised (Tyneside) intonational varieties from non-localised ones. However, on the basis of the patterns of tonic frequency just outlined, it is evident that the relative frequency of falls and rises is also varying significantly within localised Tyneside varieties. The most obvious correlate of this 'internal' variation would seem to be the sex of the child-speaker. That is, varieties in which rises are more frequent than falls and levels are realised by girls (Pattern Three). Varieties in which falls are more frequent than rises and levels are also more frequent than rises are realised by boys (Pattern One). Varieties of the Pattern Two type are ambiguous in this respect, being realised by both boys and girls. However, there is a trend for the proportion of rises in those varieties of Pattern Two which are realised by girls to be higher than in the equivalent boy varieties of this pattern.[6]

Such relationships between nuclear tones give clear evidence that we should not expect intonational varieties to be discrete. (Indeed, I suspect that such overlapping (Wittgenstinian) similarity between dimensions of linguistic variation is rather more common than variationists' accounts would suggest.) While we can distinguish between varieties with patterns of tonic frequency such as types One and Three in non-gradient terms, in varieties where the tonic frequency patterns are similar (Pattern Two types) distinctions must necessarily be probabilistic.

The various configurations of relationship between falling and rising tones warrant further detailed consideration. To do this I begin with Figures 9a,b, and investigate the dependencies between varying rates of change in falls and rises in the children's speech. These two figures plot the percentage difference between falls and rises against falls and rises respectively. The figures reveal a number of important facts about the relationship of these two tones in localised Tyneside intonational varieties. First, the percentage difference between falls and rises decreases for all children as they get older (Cath 3 is an exception to this and will be discussed later). It is clear, however, that the reasons for this directionality and the rates of decrease are different for the boys and girls taken as groups. For the girls the percentage difference between falls and rises decreases as a consequence of falling tones decreasing and rising tones increasing. For the boys, on the other hand, the narrowing percentage difference is a result of both classes of tone-type decreasing, but at different rates.

Second we see that for the girls in the sample there is a very marked dependency between the decreasing frequency of falls in their speech and the ascendency of rising tones as they get older. This trend of association for the girls shows very little deviation from linearity (for falls against percentage difference falls / rises Pearson's $R = 0.96$, significance $p < 0.001$. For rises against the same dimension, Pearson's $R = 0.95$, significance $p < 0.001$). The rank order of the various 'stages' plotted for the girls on y(% falls) in Figure 9a is remarkably well-preserved on y(% rises) in Figure 9b for Angela and Cath. However, for Claire there are certain rank order displacements. These are a result of the somewhat anomolous relationship between stages 1a and 2, and 2 and 2a in Claire's speech. Whereas between stages 1 and 1a rises increase (as do levels) and falls decrease, at stage 2 we see that there is a sudden dramatic decrease in the frequency of rises in her speech, although levels keep increasing and falls decreasing slightly.[7]

For Angela and Cath there is a fairly direct interaction between falls and rises throughout the whole period studied, whereas this interaction for Claire obtains only between stages 1 and 1a, and 2a and 3.

(We should note that for some of the other girls studied, but not reported here in detail (Janice, Kate, Anne) rises increase in their speech (a) without falls decreasing significantly, or (b) at a faster rate than falls decrease. It seems highly likely that these children are using their increased number of rises to fill out the functions of level tone - they have relatively low percentages of level tone in their speech for localised Tyneside varieties. This relationship may also be true for some of the 'interstages' plotted for Claire, Angela, and Cath.) The dependencies between falls and rises which are apparent for the girls do not hold for the boys. The decreasing frequency of rises does not covary significantly with the decreasing frequency of falls in their speech. This points to a difference in the functional relationship between the two tones in the girls' speech and that in the boys' speech. The relationship obtaining between the acquisition of rises and loss of falling tones in the girls' speech, however, is not a simple one. Consideration of Figures 9a,b shows that the rate of decrease of falls is somewhat faster than the rate of increase of rises in their speech. Thus while it seems clear that rises are taking over some of the distribution of falling tones, it cannot be the case that falls are being entirely replaced by rises. (A look forward to Figures 10a,c suggests that the level tone may also be interacting importantly with falling tone in this respect.)[8]

Figures 9a,b clarify some of the changing relationships between falling and rising tones in the speech of the girls under consideration. However, if we are to understand the relationship existing between these two tone types in the boys' speech it is necessary to turn attention to the third most frequent tone in the system: level tone. To do this I plot, in Figures 10 and 11, the relative fractions of falls, rises and levels against the percentage difference between levels and falls (Figure 10) and the percentage difference between rises and levels (Figure 11).

These plots give some indication of the important status of level tone in localised Tyneside varieties of English. Pellowe and Jones (1977) comment on the characteristics of level tone in adult varieties of Tyneside English:

> 'A very complex perturbation of the tonic system is caused by the formal-functional distinctiveness of level tone in Tyneside varieties compared with level tone in non-localised varieties .... In some varieties, the distribution [of level tone] is equivalent to non-localised levels. In some varieties part of the distribution is equivalent to non-localised levels, part to localised rises. In some varieties part of the distribution is equivalent to non-localised levels, part to localised falls. In some varieties parts of the distribution are equivalent to all three (non-localised levels, localised falls, localised rise).' (21-22)

As consideration of Figures 10 and 11 will show, there is good reason to believe that the claims made by Pellowe and Jones for adult varieties are also true for the children's varieties under discussion here.

Figure 10a: Plot of % \ on % difference \, —

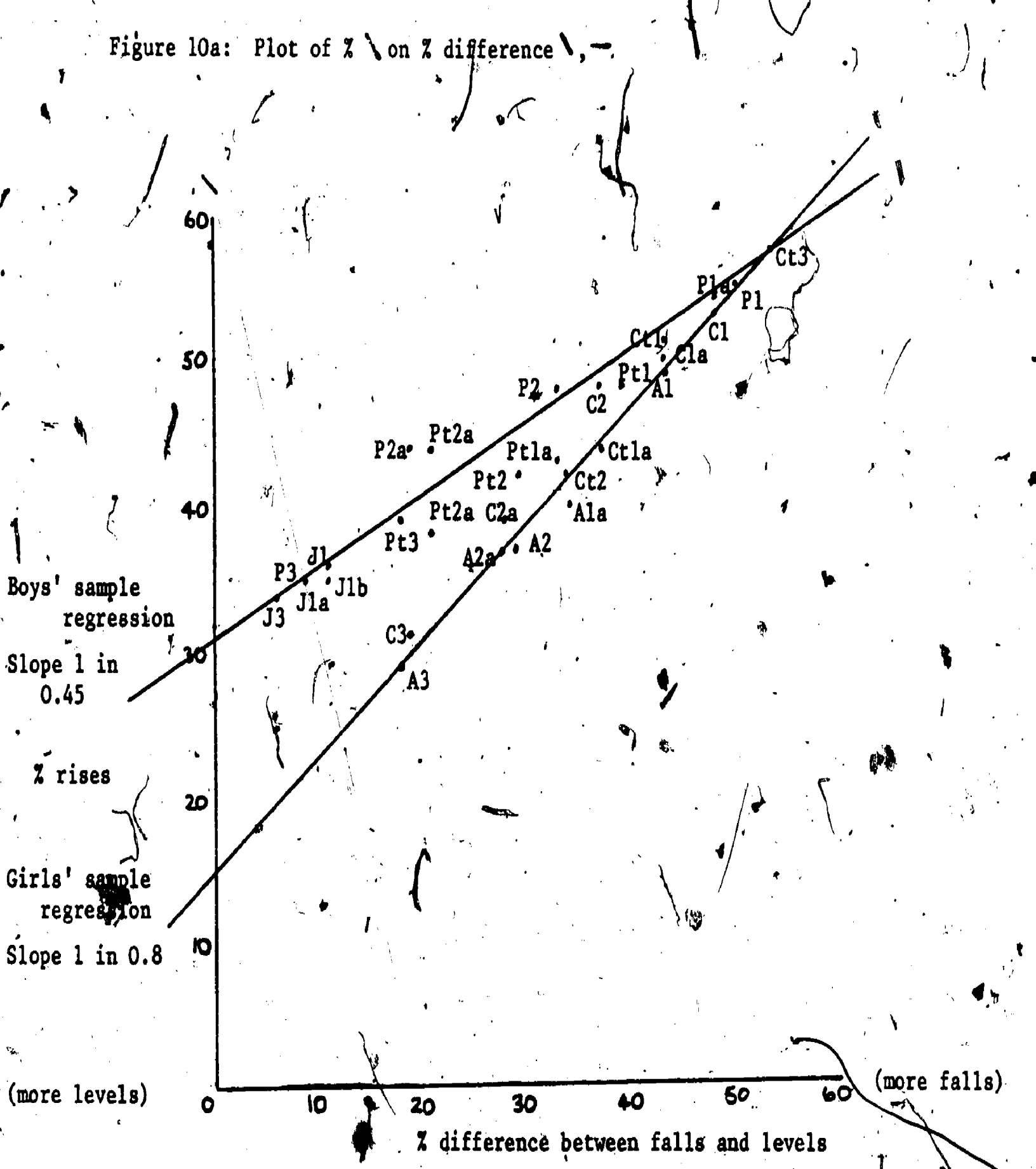


Figure 10b: Plot of % / on % difference \ -

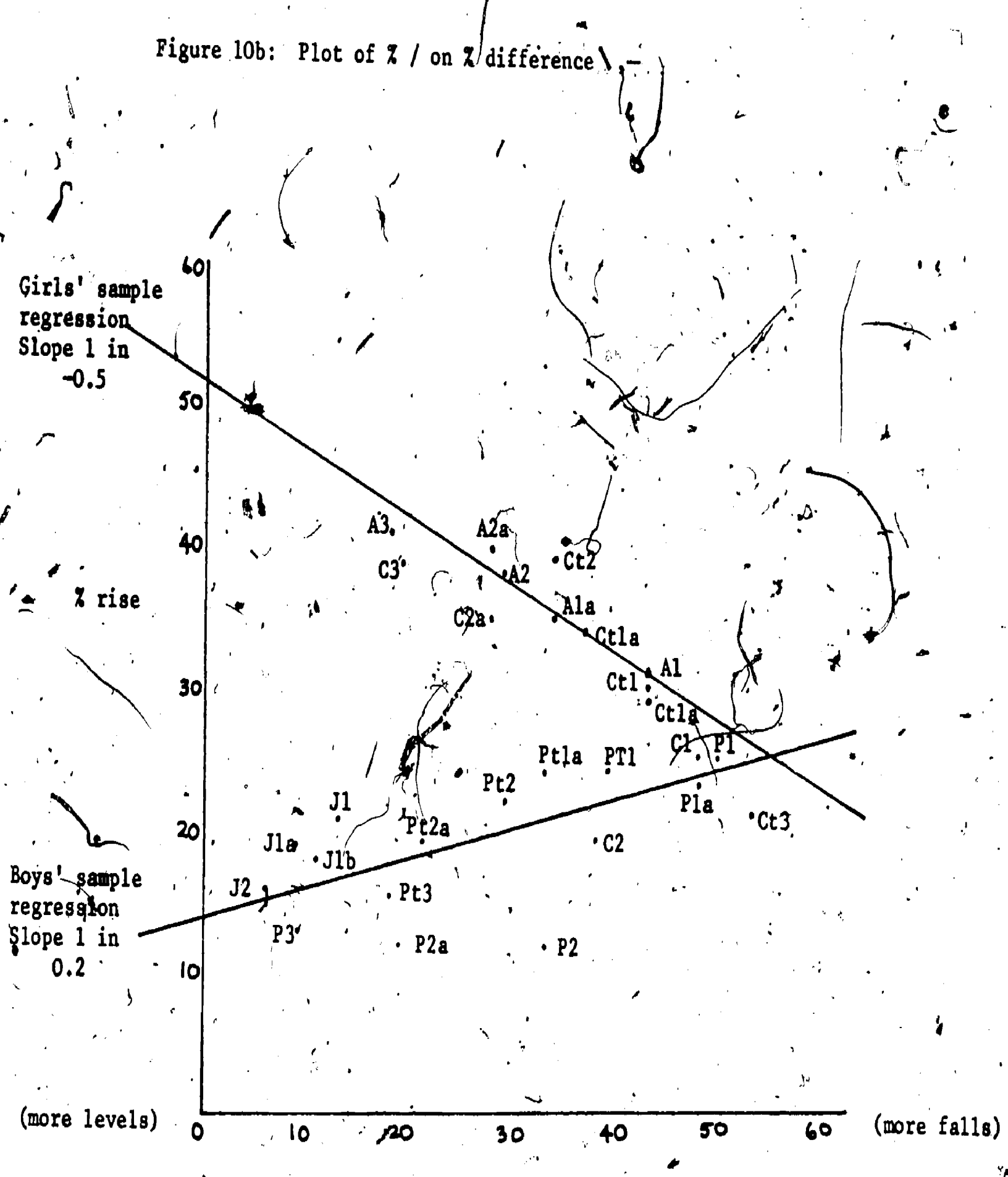


Figure 10c: Plot of % – on % difference \,–

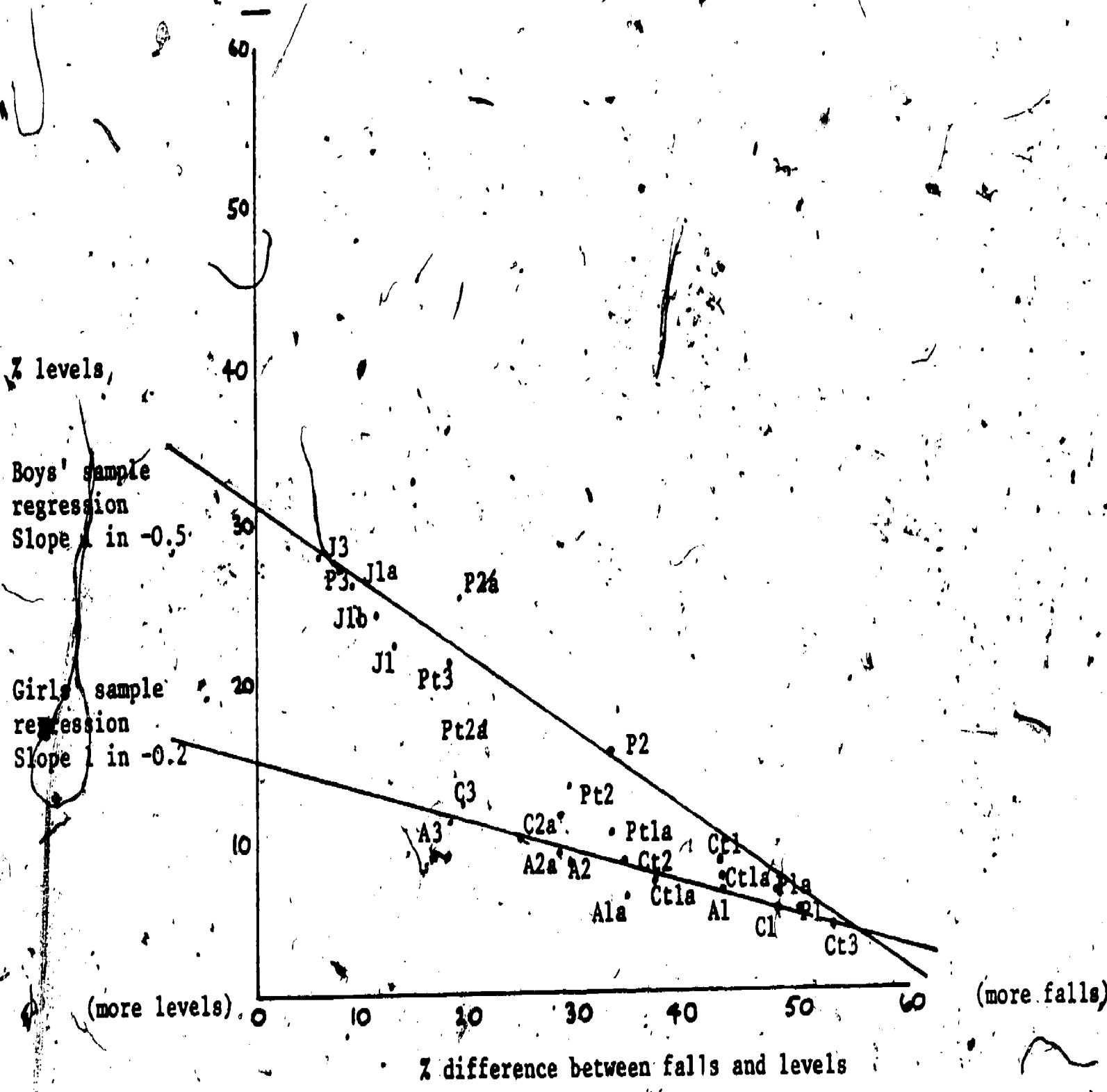


Figure 11(a); Plot of % / on % difference /,-

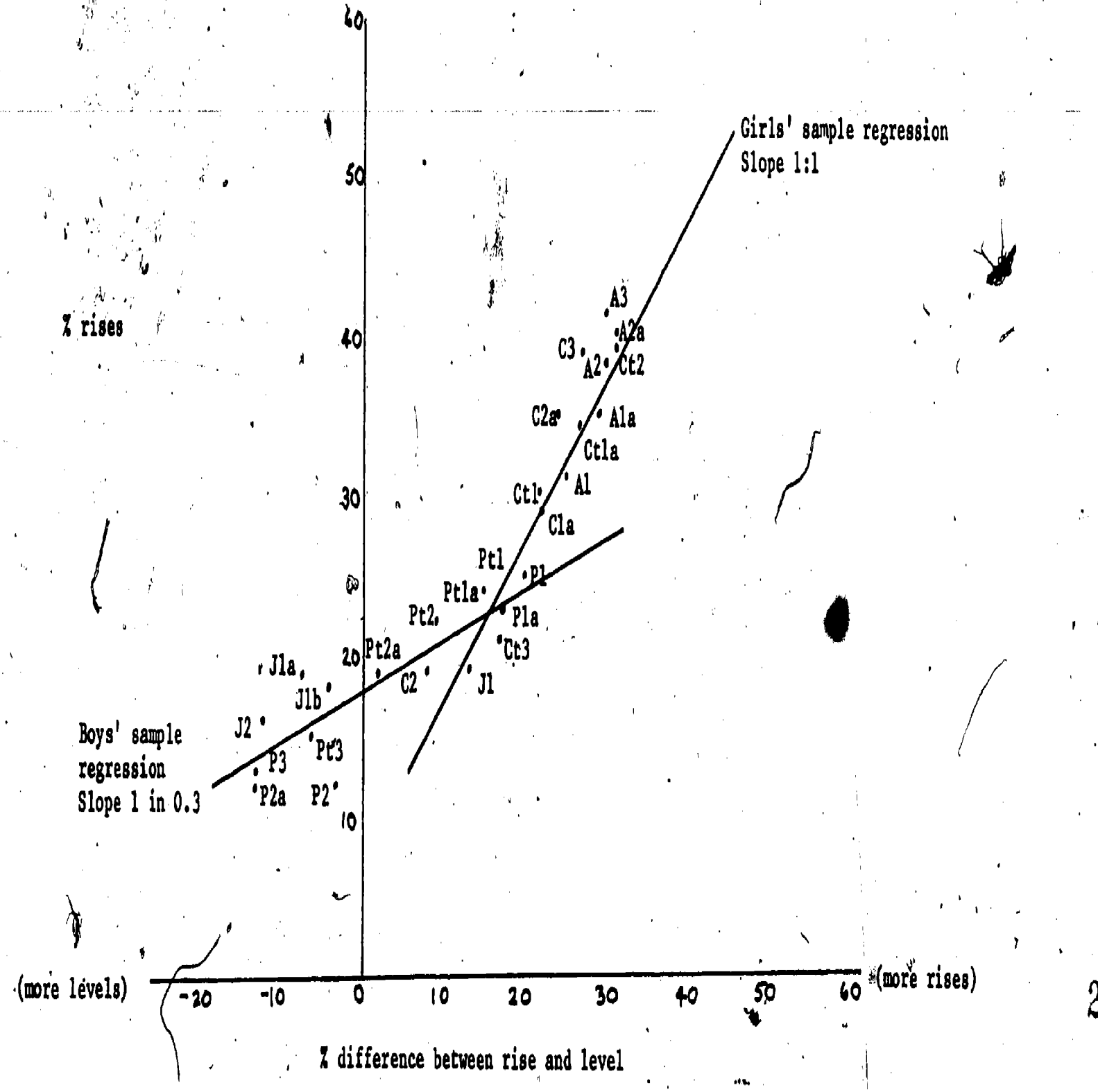
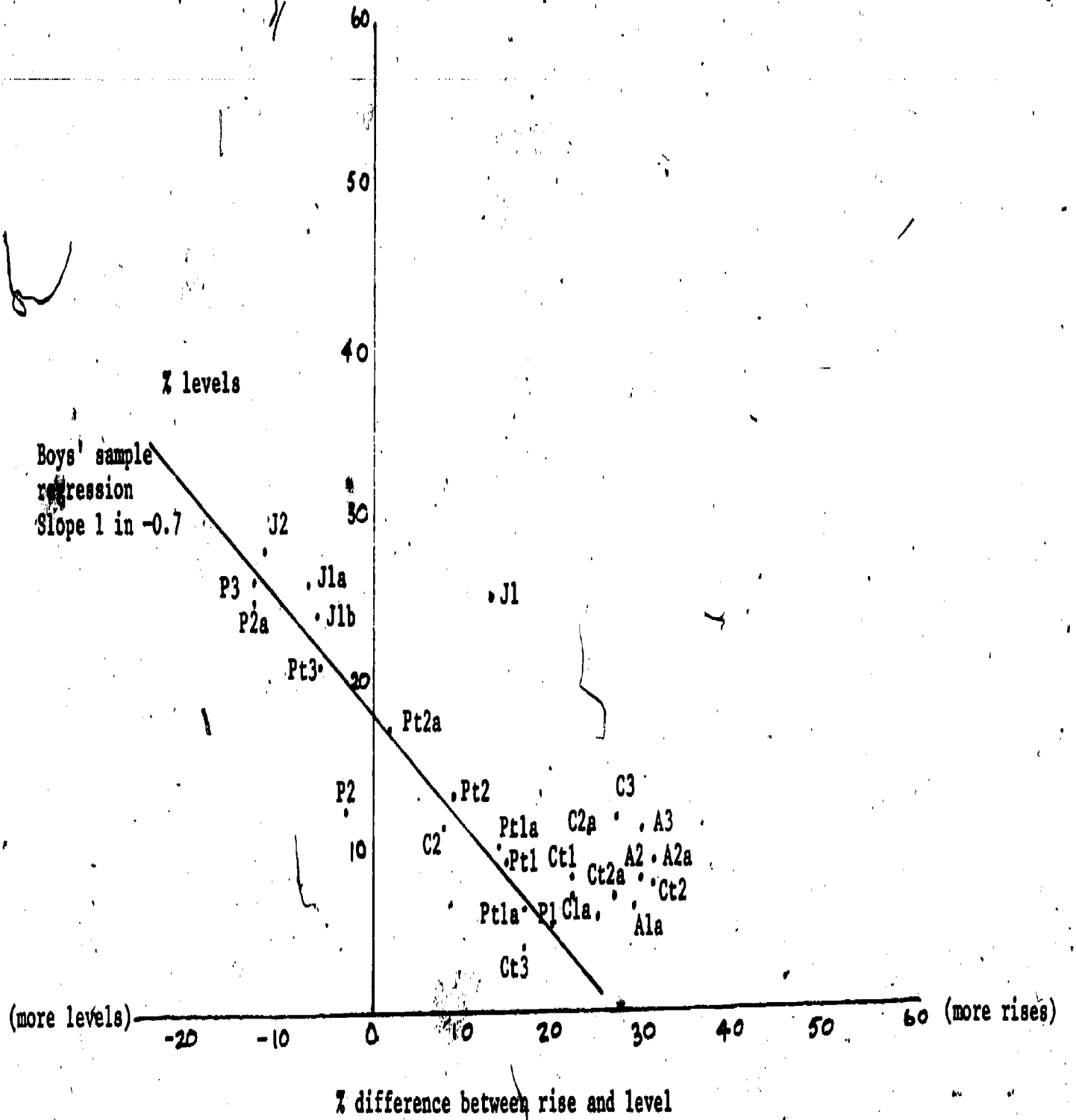


Figure 11(b): Plot of % – on % difference /,–



The first of these plots indicates that for all the children in the sample there is a strong interrelationship existing between the changing fractions of falls and level tones in their speech. (The difference between falls and levels decreases for all the children as they get older (Cath Stage 3 is again an exception).) Significantly we see here that the rates of acquisition of level tone relative to the loss of falls (see also Figure 10c) are different for the boys and girls. Girls lose falls (slope 0.8) faster than they acquire level tone (slope -0.2). (This offers confirming evidence of the functional omnivorousness of rises in their speech with respect to falls.) The reverse is the case for the boys: they acquire levels (slope 0.54) somewhat faster than they lose falls (slope 0.45). From this we may conclude that there is a rather different relationship obtaining between falls and levels in their speech. That is, levels are not only replacing falls (given the good preservation of rank order on the two independent axes in Figures 10a,c) but are also likely to be acquiring some of the functional distribution of other tones. (For further confirmation of this see Figure 11c.) This relationship between loss of falls and acquisition of levels also holds true of other boys studied (Collin, Robert, Allan).

Figure 10b (rises plotted against the changing frequencies of falls and levels) pictures two markedly different (maximally sex-differentiating) trends. We find (a) boys' varieties where the ascendency of levels over falls co-varies with a decrease in the frequency of rises and (b) the converse for girls (note that the slopes for these two trends are not the same. Girls acquire rises relative to the fractions of falls and levels faster than the boys lose rises). This again points to the likelihood of rise tone having rather different functional and distributional properties in these varieties and that the relationships which nuclear rises contract with other tones yield potential indexical information concerning the sex of the speaker.

Further details of the varying relationships between falls, rises, and levels in the speech of these children can be achieved by an examination of Figures 11a,b,c and a comparison of these figures with Figures 9 and 10. Figures 11a,b, and c plot the changing relationships between rises and levels in the children's speech. These plots add strength to the claims I have been making concerning the rather different status of rise and level tones in the different localised sub-varieties represented here. The most obvious feature highlighted here is the competing trends which are indices of the sex-differentiated varieties. We see (a) those varieties realised by boys in which the percentage difference between rises and levels progressively narrows as they get older and (b) those varieties realised by the girls in which the trend is for the percentage difference between rises and levels to increase. Figure 11a emphasises the sex-differentiating aspect of these intonational varieties. For the boys a unit decrease in the use of falls in their speech leads to the ascendency of levels over rises by 0.5, whereas for the girls a unit decrease in the use of falls leads to the ascendency of rises over levels by 0.8. These relationships are strongly linear and highly significant ($p < 0.001$ in both cases).

Comparison of Figures 11a and 11b adds further credence to the claim that levels in the boys' speech take over some of the distributional characteristics of rise tones. There is a highly significant linear relationship between the decreasing percentage difference between rise and level tones in their speech and the increase in level tones. (Again the rank ordering of the stages

sampled is well preserved on the independent axes of the graphs.) The interaction between these two tones is not simple, however. There is an assymetry between the speed of loss of rises in the boys' speech (relative to levels) (slope 0.3) and the speed of acquisition of levels (relative to rises) (Slope 0.7). Clearly boys are acquiring levels twice as fast as they are losing rises. Given the discussion of Figures 9-10, it is quite clear that the increase in level tones interacts significantly with the decrease in falls and the decrease in rises. In both cases the rate of acquisition of levels for the boys (as a group) is faster than the loss of these two classes of tone.

Figures 11a,b picture an apparently contradictory state of affairs for relationships in the girls' varieties. Figure 11a shows that there exists a marked linear relationship between rises and the changing relationship between rises and levels (a unit increase in the use of rises results in rises gaining over levels by 1). However, when we examine 11c there is no clear sample regression which would lead us to conclude that levels are determining these tonic relationships. Explanation lies, I think, in the ambiguous status of level tone in the girls' speech. As we have seen rises increase steadily and significantly with respect to all other tones. Levels also increase, though at a much slower rate. I have argued that the larger proportion of these increased rises is filling out the depleted number of falls in the girls' speech. At the same time some of the increased number of levels would seem to be also filling out the distribuiton of decreasing falls. (This is confirmed by a cursory analysis of the transcripts.) Thus we can argue that lack of sample regression is due to the differing kinds of individual variation (in terms of the roles of rises and levels) exhibited by the children. Close inspection of the relative locations of the 'interstages' for the girls plotted in Figure 11b suggests that there may be some stages where increased rises are being used to 'take up the slack' on levels, as well as doing the same for falls. (For example, Claire 2-2a; Angela 1-1a; Cath 1a-2.) This is evidenced by the relatively 'horizontal' movement along the plot as they get older. Such facts as these are important in establishing the variable structure of intonational varieties.

So far, in my discussion of Figures 9-11, I have been using the directionality and rates of change in tonic frequencies to argue for exchange/replacement relationships between tones in the children's speech. An important feature of these arguments has been the extent to which rank ordering of the stages with respect to the loss or acquisition of one tone was well preserved for the loss or acquisition of another tone. I have shown that for most of the children the directionality and rank order of changing follows roughly similar patterns (I have already indicated some of Claire's 'stages' as exceptions). There is one major exception to these similar trends. In all respects the sample of Cath's speech at 'stage 3' is wayward in terms of the girls' sample as a whole, and in terms of the early stages plotted for Cath. Up to 'stage 2' she appears to be acquiring an intonational system (at least in terms of the three major tone classes) which closely resembles that of Claire and Angela. At stage 3, however, there are a number of marked reversals in the trends established by the earlier stages:

1. falls increase
2. rises decrease
3. levels decrease

These reversals are clearly anomalous for Cath (a) as a child acquiring a localised Tyneside intonational variety, and (b) as a Tyneside girl. (We should note that the changes observed for Claire stage 2, though odd in some respects, still bear the marks of a localised variety - though the frequency of falls remains high and the frequency of rises drops sharply, the relative frequency of level tones is high (as compared, say, to Cath at stage 3).) Is it possible then to account for the markedly different behaviour of Cath at stage 3? The most plausible explanation is, I think, to be located in the fact that this sample of speech was recorded some six months after Cath's family had moved from Tyneside to the south of England (Surrey). The relative fractions of falls, rises and levels for Cath at stage 3 are remarkably similar to those pictured for the six non-localised children (Figure 8). We can argue convincingly that the changes in tonic frequency exhibited by Cath at this stage reflect the importance of change of region to Cath as a hearer-speaker. Presumably the family's move from Tyneside, and Cath's mixing with a new peer group having other-localised and non-localised intonation varieties has exerted considerable influence on the characteristics of her non-segmental realisations. (There are, not unexpectedly, some other changes in Cath's speech when this sample is compared with earlier ones. Very obvious changes occur at the segmental level - most noticeably in the realisation of vowels.)

The case of Cath raises a number of questions concerning the 'reasons' underlying the changes in the tonic systems of the other children.

1. Are the changes 'internal' system changes - relatively independent of 'non-linguistic' factors? This would seem a priori unlikely given the rather obvious co-variation of patterns of tonic frequency and sex of the children. Nonetheless some of the changes would seem to be related to the development of other parts of the children's language (i.e., the acquisition of complex and compound tone and the children's acquisition of a broadened range of syntactic structures).

2. What is the nature of the children's system at 'stage 1'? What changes have led up to the tonic frequencies observed here?

3. How do these children's systems map onto the early developments postulated for instance by Crystal (1979)?

4. What is the relationship of the children's systems to those of their parents?

Unfortunately, I have no data for these children from any earlier periods in their speech. Thus it is not possible to say whether or in what ways their tonic systems varied before the first samples shown here. Again it seems a priori unlikely that there were not changes occurring in the children's speech (it is of course highly likely that the 'latest' stages given for these children also picture 'transitory' varieties). Thus it is not possible to say to what extent the stages outlined by Crystal (1979) might map onto the present findings. Moreover, it is not clear whether Cyrstal's outline is universal, general English, or English variety specific. (Crystal suggests the following order of tonic contrasts for the very early period of acquisition from 11 to 18 months:

1. fall vs level
2. fall vs high rise
3. fall vs high fall
4. rise vs high rise
5. fall vs high rise-fall
6. rise vs fall-rise
7. high rise-fall vs rise-fall

It is difficult to know moreover whether there are physiological and/or functional-linguistic system constraints on this order of acquisition. Nowhere does Crystal make clear what the relationship between these contrasts is. (Are we to assume that each new contrast is added to the existing ones? Does each new contrast replace existing contrasts or does it redistribute the functional domain of earlier contrasts?))

Nonetheless the children do seem to move from a 'simple' system to a more 'complex' one. Initially falls and rises achieve a considerable amount of work, but gradually the tonal inventory is extended and the functional weight of these tones is redistributed across other tones. (I have, however, heard young (3-5 years old) localised Tyneside speakers whose intonational systems did not seem to be so heavily dependent on falls and rises as the children considered here.) At the first stage studied all these children have non-segmental systems where falls and rises carry a heavy functional load. This offers some confirmation of the claim made by Halliday (1975) concerning the primacy of falls versus rises in intonation systems. However, given the kinds of relationship shown to exist between the tone types discussed, I would not wish to associate myself with Halliday's claim that:

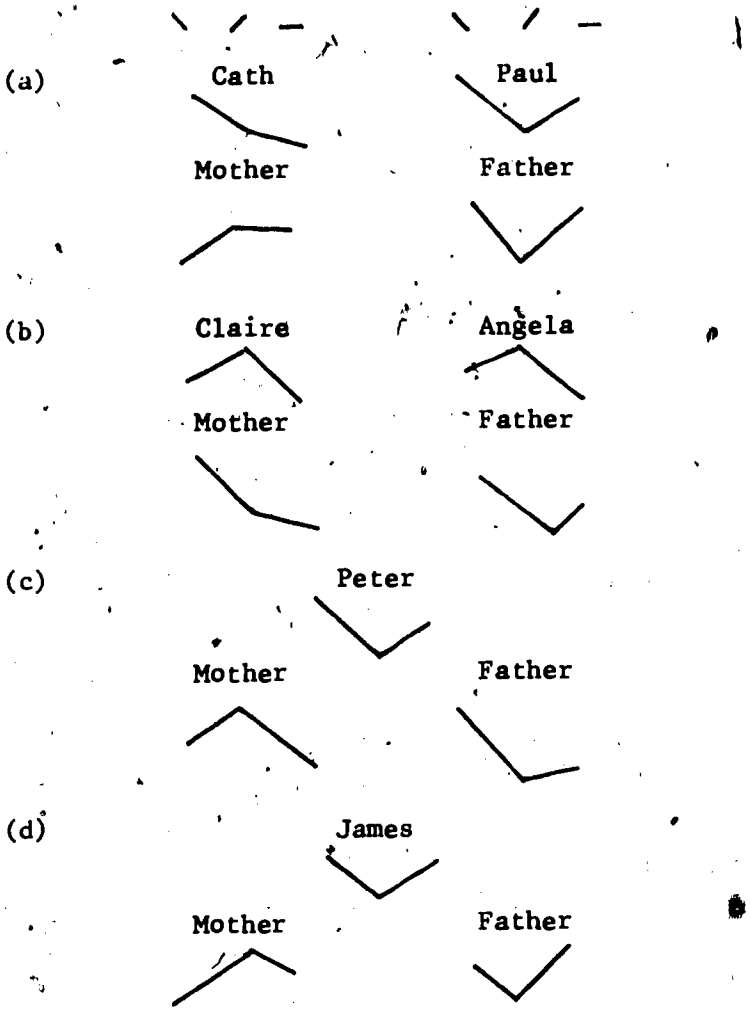
> 'The rise fall opposition is the heart of the adult intonation system; ... all the meanings [my emphasis] of the tones can be explained on the basis of this simple system, in which falling means 'decided' ... and rising 'undecided'. ' (1975:136)

While such a statement may have value as some kind of 'shorthand generalisation' its significance is severely limited. The data discussed in this paper indicate clearly that there exists the problem of functional relationship between phonetically different realisations of intonational features in different varieties, and overlap between the 'same' intonational contrast in different varieties. Thus, while we might expect there to be some 'functional overlap/similarity' between rising tonies in the different localised boy/girl varieties, we would be grossly misguided if we expected functional isomorphism.

Clearly a monitoring of 'transient' varieties from a much larger sample of children would assist in explicating and clarifying the change observed in tonic frequencies. (It may well be that the present study has accidentally hit upon a crucial period for change: the transition from home to school.) Such a monitoring may also help to throw some light on the apparent assymetries between the intonational varieties of the children and those of their parents. Discussion of this area is outside the scope of this paper (but see Local, in prep.). We can only note here that the available evidence indicates that the children are not simply acquiring the adult (input?) varieties. Further investigation of these matters, should offer some insights into the ill-defined notion of the 'linguistic system' to which the children are heading. I present profiles (in terms of falls, rises and levels)

of the parents' and children's varieties without further discussion in Table 5.

Table 5 Tone frequency patterns for children and parents



Throughout this paper I have been discussing tone types and tonic distributions relatively independently of their functional properties. It is just conceivable that some investigators would accuse me of ignoring the functions of intonational categories. In fact, it seems to me that the arguments I have been pursuing and the methods of modelling intonational variability I have presented are a crucial first step towards being able to say anything sensible about the functional potential of particular intonational contrasts.

I do not think it is possible to delimit (in anything other than an ad hoc way) the functions of particular (co-occurrences of) intonational features in a given variety until we have information concerning the distribution and status of those features within those varieties. Intonational

'functions' are achieved primarily by the manipulation of *realisational* variability. However, realisational variability operates against the 'backcloth' of lectal variability. Therefore, we must first determine the structural/distributional characteristics of lectal variability before we can identify the ways in which realisational variability can project 'functions'.

Conclusion

I have outlined some simple first steps towards the modelling of lectal intonational variability in children's speech. By examining a number of overlapping representations of tonic frequency distributions it has proved possible to establish significant patterns of variation in the non-segmental systems of a number of children. We have been able to show patterns of development towards localised intonational systems and to indicate some important 'non-linguistic' co-variates of intonational structure.

The methods discussed here give us access to a means of monitoring the change through time of intonational systems. (They also give us the opportunity of establishing the distribution of intonational features with respect to different kinds of interaction.) The patterns of variation revealed for these localised Tyneside children converge on those discussed for localised Tyneside adults by Pellowe and Jones (1978).

Perhaps most importantly the present paper emphasises the need to define and examine critically the dependencies between variables in linguistic investigations. Despite the considerable amount of research concerning the nature of sociolinguistic variation, very little is known about the relative importance of the variable systems involved (which ones are salient for hearers; which enter crucially into linguistic change, etc.). Characteristically, sociolinguistic surveys have restricted their investigations of linguistic variation to one sub-domain: usually segmental phonology. Within this sub-domain researchers have typically selected a small number of phonemic variables for study. Consequently because of such fragmentary selection of variables we lack information concerning the relative importance of segmental variation, for instance, to speakers and hearers, as compared with lexical syntactic or non-segmental variation. This raises serious problems about the interpretation of variability in the speech of children (and also of course in the speech of adults). As many reports of children's language indicate, children acquire competence in different aspects of their language at different times (cf. Ferguson and Farwell (1975); Bloom, Lightbown, and Hood (1975)). The existence of systematic variation at one level of (a child's) linguistic structure does not necessarily mean that such systematic variation exists at another level (or that the correlates of linguistic variation at one level will be the same as those at another level. (For a discussion of these matters see Garvey and Dickstein (1972) and Local, in prep.)

In order to gain an adequate understanding of the nature of linguistic variability in children's language it is of considerable importance to explore the dependencies which exist between variables and between variability at different levels. This paper has attempted to approach some of these problems and to investigate some of their implications.

FOOTNOTES

* Parts of this paper have been given at the Child Language Seminar, Reading, 1979, and the Sociolinguistics Colloquium, Walsall, 1979. I am grateful for those comments which I received at these two gatherings which have helped me improve this paper in any way.

1 Many of the procedures and assumptions rehearsed in this paper derive directly from the work of the Tyneside Linguistic Survey (for details see Pellowe et al., 1972).

2 For some details of the tonic frequencies for these other localised children see Table 4 below. These children will not be discussed in detail because either the number of stages sampled or their ages when their speech was sampled render the data not fully comparable with that of the other (six) localised children.

The terms 'localised' and 'non-localised' will be used throughout this paper in the sense of Pellowe et al. (1972): 'We may characterise, for the sake of shorthand convenience, British speech on a scale from non-localised (exhibiting no evidence of geographical provenance) to localised (being ascribable in varying degree to a particular locality). The term 'other-localised' is also useful shorthand, when we come to talk of linguistic in- and out-groups.'

3 The non-segmental transcriptions of the children's speech were all checked and validated by at least one other linguist. Only unambiguously agreed transcriptions are admitted for quantification.

4 It is not at all clear what the differences between the respective child and adult samples mean, apart from the fact that they indicate that the children have not yet achieved completely adult-like intonational systems. It is worth noting, however, that these differences are to be located in that part of the system of nuclear tone which Crystal (1969) designates 'complex' and 'compound' tone. This may well reflect something about the children's acquisition of particular grammatical constructions and semantic contrasts and the relative frequency of particular syntactic structures in their speech. This issue is further complicated for the localised Tyneside children, however. As I will show below, although the proportions of tones in their speech at this latest stage resemble the adult system, the actual frequency of particular tones in the speech of individual children is rather different from that of the adults. (This draws attention to the problem, little treated in (socio)linguistic literature, of the relevant levels of representation for variation-data, and of dependencies between variables.) For further discussion of such issues, see Garvey and Dickstein, 1972; Local, in prep.

5 In fact, use of declarative structures as questions in interaction does not appear to be a strategy employed by these children. There are, of course, problems associated with any attempt to delimit uniquely the 'functions' of utterances in naturally-occurring speech, but even

allowing for this, the author (in collaboration with another linguist) was only able to identify eight possible instances of declarative structures intonationally marked and used as questions in the Tyneside children's speech. Five of these occurred in the speech of Catherine at 'stage 3' (as I will show below there are good reasons for considering this sample of Catherine's speech to be atypical as part of a sample of localised Tyneside speech). Two possible instances (one with level tone) occurred in the speech of Paul at 'stage 2'. One possible instance (with rise tone) occurred in the speech of Claire at 'stage 2'. By comparison, at the latest stage recorded for the non-localised children there were twenty-six unambiguous examples of declarative structure realised with a nuclear rise which functioned as questions. This difference is almost certainly a consequence of the rather different status of nuclear rising tone in localised Tynesdie and non-localised speech (see further below).

6 Pellowe and Jones (1978) also found that the percentage difference between falls and rises for adult speakers of localised Tyneside speakers was sex-differentiating. Men were found to have high values on the dimension and women to have low (including negative) ones. The present findings offer confirmation of the sociolinguistic relevance of such non-segmental relationships for Tynesiders.

7 The apparent anomolousness of this tonic patterning (in terms of the girls' sample as a whole) may be explicable in terms of Claire's 'non-linguistic' behaviour at this time. At the time this sample of speech was recorded Claire was reported (by her parents) to be becoming 'a proper tomboy' in terms of both her interests and the groups of children she associated with. It may well be then that this 'adjustment' of tonic frequencies is a reflection of some kind of network 'convergence' (cf. Milroy and Margrain, 1978).

8 In addition it is worth pointing out that the relationship between the gross percentage of falls and rises in the children's speech co-varies with localised realisations at the segmental level. Among the girls, those with the lowest (and negative) values on this dimension exhibit the most localised realisations - similarly with the boys. It is not the case, however, that the children with the lowest absolute value on this dimension have the most localised segmental realisations. (All my efforts to locate co-variation between localised segmental variants and indices of socio-economic class were remarkably unsuccessful).

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