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Prosody and interaction in atypical and typical language development

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Les études de la prosodie dans les interactions conversationnelles ont mis en évidence la façon complexe et subtile dont font preuve les locuteurs dans l'utilisation des traits prosodiques pour négocier lors des interactions quotidiennes. Dans les analyses développementales et cliniques, la question est de savoir comment les enfants apprennent à gérer (ou n'apprennent pas à le faire) la façon de maintenir l'interaction sociale, malgré des limitations prosodiques ou d'un autre ordre. La première partie de l'article est centrée sur le développement typique: la façon dont un enfant entre 19-21 mois et la personne qui s'en occupe s'orientent vers un système de signalisation par la prosodie est décrite, système permettant à l'enfant de construire des tours de parole étendus. Dans la deuxième partie de l'article, l'application clinique de ce concept est illustrée par des données concernant tout d'abord un garçon de 5 ans présentant des troubles du développement du langage et de la parole, et ensuite un garçon de 11 ans avec un autisme sévère. Il est montré que les deux enfants, malgré leurs patterns prosodiques inhabituels, ont conscience d'un système de signalisation prosodique qui régule l'alternance des tours de parole et s'orientent vers un tel système.

1. Introduction

Pitch, loudness and tempo are fundamental properties of all talk. Changes in these parameters routinely occur within a single utterance or turn at talk. Moreover, different utterance or turn types may be distinguished from one another by varying one or more of these parameters. The ways in which these prosodic parameters are systematically manipulated differ from language to language. This is therefore one aspect of spoken language that children need to learn.

The mastery of prosodic features at the level of the utterance, sentence or turn, has been a rather neglected area in language acquisition studies (for a valuable review of much of the research that has been carried out, see Snow & Balog, 2002). This neglect is unfortunate: prosodic features have communicative importance in their own right: they may serve to delimit or 'chunk' talk into interactionally or informationally relevant units; they may serve to highlight or focus on particular elements of the utterance; and they are often thought to be responsible for conveying emotion or affect. Furthermore, prosody interfaces with other linguistic levels, e.g. syntax. The latter point has been explored with reference to prosodic aspects of talk that the infant hears and its effect on the acquisition of grammar (the 'prosodic bootstrapping hypothesis', e.g. Morgan & Demuth, 1996). However, the relation between

prosodic structure and grammatical development in the child's own productions has been less studied.

Prosodic development in atypical populations has received even less attention. In part this can be attributed to the general bias in language acquisition studies towards those aspects of (adult) spoken language that historically have been given a written form, i.e. words and their arrangement in sentences. Another likely reason is that for many children presenting with difficulties of spoken language development, prosodic problems are not evident. Difficulties with segmental (particularly consonant) production, or with vocabulary development, and / or with grammatical development are much more likely to lead to referral to speech and language therapy. Nevertheless, there are at least three reasons why prosodic research is warranted in the population of children with developmental speech and language difficulties. First, some children are encountered in the clinical situation who have overtly atypical prosody. Two cases will be discussed later in this article. For such children, some understanding of the nature and causes of their prosodic difficulties is important if appropriate intervention is to be provided. Second, some children may have more hidden problems, revealing deficits in the comprehension of aspects of prosody even though their own prosodic production does not appear to be unusual (Wells & Peppé, 2003). Increasing sophistication in the instruments that researchers devise for the testing of prosodic understanding (e.g. Peppé & McCann, 2003; Laval & Bert-Erboul, 2005) is likely to lead to new insights into the nature and prevalence of these more hidden prosodic deficits. Third, by studying atypical prosodic patterns in children we may gain insights into what constitutes typical development. Conversely, the study of paths and mechanisms of typical development promises to give insight into atypical patterns.

It is possible to choose from a range of methodologies in order to investigate typical or atypical prosodic development. Several of the studies cited above address the child's comprehension of intonation, by testing the child under experimental conditions, using carefully designed stimuli. The test approach has also been used to investigate children's ability to produce intonation, as in the PEPS-C battery (Wells, Peppé & Goulandris, 2004; Peppé *et al.*, 2007) and similar batteries (e.g. Samuelsson & Nettelbladt, 2004). A test based approach is useful with children from age four or five and above but is hard to use with children younger than that, or indeed with older children who have a low cognitive level. In addition, using a test necessarily entails making a decision about what aspects of intonation and its meaning are to be tested – not a straightforward decision, given the diversity of meaning potentially conveyed by prosody. Moreover, scoring of the child's productions relies on the tester's judgement as to what is 'right' or 'wrong' – a difficult decision given the range of possible prosodic patterns found in the everyday talk of adults.

A further drawback of a test-based approach is that it removes the child's production of prosody from the context of everyday spoken interaction which is the natural habitat of prosody and which, it is generally accepted, is likely to have a large impact on an individual's selection of prosodic pattern. This problem has been avoided in studies using a more directly phonetic approach to the study of prosodic development, as in the research of David Snow and his collaborators. In some of these studies, the young child's productions are collected in relatively free play situations, following which fundamental frequency and other prosodic parameters are measured. Using a cross-sectional or longitudinal design, age related differences in the frequency and shape of intonation contours can be identified (e.g. Snow, 2006). An advantage of this approach is that it can be used with very young children, or those who might be unable to participate in a formal test.

The principal limitation of a purely phonetic approach is that it is unable to shed much light on how children use prosodic features to convey the range of meanings that prosodic features seem to convey in the adult language; and how this ability to convey meaning changes and develops over time. Some studies have attempted to address this question. For example, Flax, Lahey, Harris and Boothroyd (1991) recorded three American English-speaking mother-child dyads at three time points throughout the second year of life. The aim was to relate prosodic features to communicative functions. Measurements of fundamental frequency direction were made of all utterances, which were then collapsed into two categories: rise vs. non-rise. Communicative functions were derived from earlier studies and included four types of request, three kinds of comment, etc. The children's utterances were assigned to these communicative categories by the researchers, with provisions for inter-rater reliability. Three findings are particularly relevant. First, there was no change over time for any child in the relation between contextual function and terminal contour (rise vs. non-rise). Second, there was a lot of difference between children regarding proportion of rise vs. non-rise contours used. Third, although rising tones tended to be used for 'requesting' functions (rather than other functions), other tones (e.g. falls) were also used for requesting functions. Thus there was no consistent mapping of intonational form to communicative function. It is clearly difficult to draw firm conclusions from these results about the development of intonation in relation to communicative function. Following these inconclusive results, Flax *et al.* (1991) recommended more detailed research on the input from caregivers, as this may be a factor in determining how a child uses particular pitch patterns. They also suggested that future research should consider not just caregivers' input but also the children's *interactions* with caregivers. They suggest that in their study the children's use of rise vs. non-rise might have been influenced by quite local factors in the interaction.

More recent research has questioned some basic assumptions underlying such approaches to children's intonation development (Wells & Corrin, 2004). One is that linguists can reliably identify pragmatic functions on the basis of observations informed by general theorising, and/or their intuitions. Another is that functions of intonation can be identified without careful reference to the interactional context in which the intonation pattern occurs. The interactional linguistic approach, illustrated in this article, shares a concern with accurate phonetic / linguistic description of the prosodic design of the child's utterances. However, it is equally concerned with prosodic *placement,* i.e. the location of particular intonation contours and accentual patterns in the interactional sequence. Related to this focus on prosody located within talk-in-interaction is the view that the development of prosodic systems by the child is a *collaborative* achievement, in which the child's interlocutors, e.g. caregivers, have a central role, not just by providing 'input', but by reacting in meaningful ways to the child's turns at talk. Following the principles of Conversation Analysis (cf. Schegloff, 2007), evidence for the functional status of prosodic features is drawn not from the researcher's or other observers' intuitions but from the *observable behaviour of co-participants* in the interaction itself.

This approach will now be illustrated with reference to three children. Robin is a young typically developing child. Studying him in interaction with his mother around the age of 1;07 – 1;09, we can see how aspects of English intonation systems are made accessible to him in the course of talk-in-interaction. We can also see how this access to prosodic structure permits grammatical and interactional development. Insights from the case of Robin will then be applied to the case of David (CA 5;04), a boy with expressive speech and language difficulties who in his talk uses one pervasive and unusual intonation pattern. Finally, we will consider the prosodic patterns of Kevin (CA 11;04), a boy with severe autism. In each case, the procedure involves description of the child's prosodic patterns, then identification of the interactional contexts in which these patterns occur. The principal question is: how do these interactional contingencies give the child access to the language's prosodic systems? Data extracts are presented to illustrate the results of each analysis.

2. Robin: a case of typical development

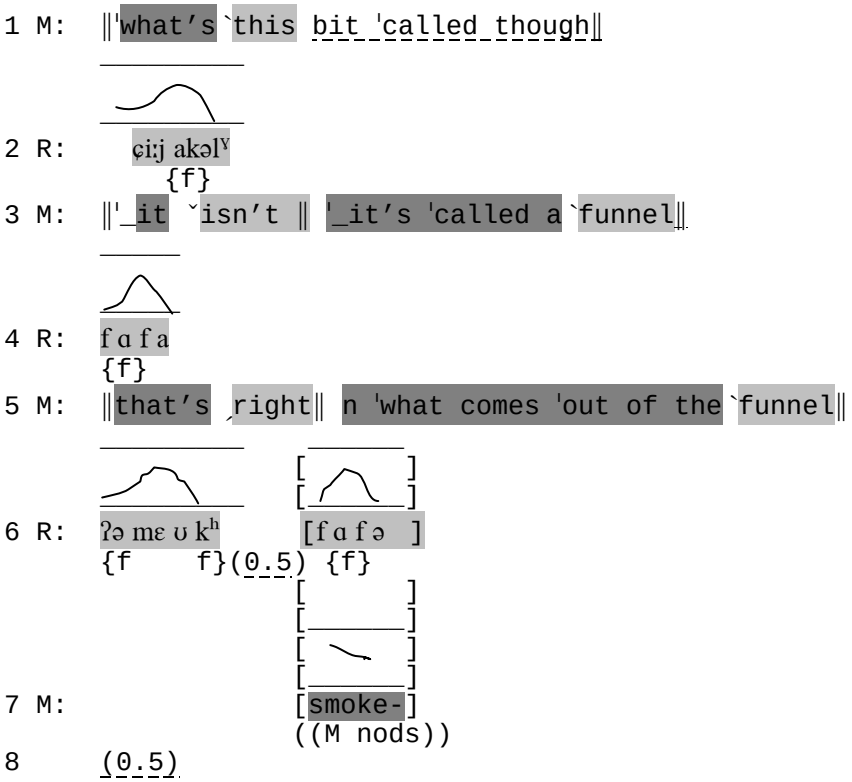
Eight video and audio recordings, each c. 20 – 30 minutes, were made of Robin (CA 1;07 – 1;09) and his mother, when engaged in play activities that mainly involved a puzzle board into which Robin was encouraged to fit pieces. The recordings were made at home, with a researcher present operating the camera. Orthographic transcripts were prepared. Prosodic features were transcribed impressionistically, key portions being analysed acoustically, using PRAAT software. Orthographic transcription conventions are those of Conversation Analysis, developed by Gail Jefferson, and summarised in Appendix 1 of Schegloff (2007). Segmental aspects of Robin's talk are

represented using IPA symbols and diacritics. Prosodic features of Robin's talk are represented impressionistically, pitch being shown between staves denoting the assumed upper and lower limits of his normal pitch range. Shading and underlining conventions are explained below.

Detailed analysis of a range of relevant data extracts from these recordings can be found in Corrin, Tarplee & Wells (2001) and Wells & Corrin (2004). In the present article, the focus is initially on an extract of around half a minute (Extract 1). The piece of the puzzle that they are concerned with represents a railway train. Mother is attempting to get from Robin an accurate label for the funnel, out of which smoke comes. Robin's attempts, prior to the start of the extract and in line 2, suggest that he is producing the word CIRCLE rather than FUNNEL.

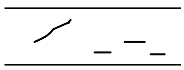
Prosodic features of Mother's talk are represented using a phonological notation derived from Halliday (1967). While more recent notational innovations have proved useful for capturing phonetic details of mature intonation patterns (cf. Jun, 2005), these have not yet had an impact on research in children's intonation development (Snow & Balog, 2002). For present purposes, the phonological notation, described below, is assumed to represent key structures and systems of English intonation, which form part of the linguistic resources of mature English speakers of Southern British English, such as Robin's mother, and which represent part of what children have to learn in order to be proficient speakers of this variety.

Example 1: **Robin RB8**



```
9 M:  ‖`smoke comes out of the ˈfunnel‖ `doesn't it‖
      (( Mother nods))
10    (1.5)
11 M: ‖´hm‖
12    (1.6)

13 M: ‖s that ´right‖
14    (2.1)
15 R: (unintelligible whisper)
16    (1.0)
```



```
17 R: m̥mək ə fɐfɐː
18 M:‖ˈthat's ˆright‖ ˆsmoke out of the funnel‖
```

The basic structural unit is the Tone Unit, the boundaries of which are notated: ||… ||. Thus M's turn in line 1 comprises one Tone Unit, whereas line 3 consists of two Tone Units. Each Tone Unit must contain one Tonic. The Tonic comprises a noticeable pitch movement, known as the Tone, which normally ends near the top or base of the speaker's range. Tones include: fall, rise, rise fall, fall rise. While the Tonic is frequently located on the stressed syllable of the final word in the Tone Unit (as in l.3 and 5), in English this is by no means obligatory: an earlier location of the tonic can be found if an earlier word is to be focussed or emphasised, as in lines 1, 9 and 18. The part of the Tone Unit that precedes the Tonic is called the Head: while the Head can take various shapes, it does not normally contain pitch movements that reach the extremes of the pitch range. The Head can be preceded by unstressed syllables known as the Pre-head, not further discussed here. The part of the Tone Unit that follows the Tonic is known as the Tail. The Tail generally continues the direction of the tone at the tonic syllable. This gives the following structure:

‖ (pre-head) ˈ (head) ˆtonic syllable (tail) ‖

Elements in brackets are optional; this means that a short utterance of a single monosyllabic word can be an intonationally complete Tone Unit, if it carries a Tone, since the word thereby becomes a Tonic syllable.

Tone Unit boundaries frequently indicate a potential place for change of speaker, i.e. a turn *transition relevance place* or TRP (Wells & Macfarlane, 1998). For this reason, prosody is important for the regulation of turn-exchange and as such can be thought of as providing a system of traffic lights. While the current speaker is still in the Head of her Tone Unit, the lights are on red, even if she pauses: if someone else starts talking now, they will be heard as competing for the floor. Once the current speaker reaches her Tonic, the lights change to yellow, and other potential speakers may gear up to start talking. Completion of the tonic pitch movement is the green light: it will usually be treated as a TRP, i.e. a legitimate place for a new speaker to start up, (unless the current speaker takes steps to prevent this by joining the current

tone unit to her next one syntactically and/or phonetically, as Mother does in l.9 – cf. Schegloff, 1987; Local & Walker, 2004). The new speaker may start up in overlap with a Tail produced by the current speaker (so called 'Terminal overlap', Jefferson, 1984) or, more often, when the current speaker has finished talking. In the following schematic representation, and in the extracts throughout the article, dark grey highlight represents a RED LIGHT, light grey highlight represents a YELLOW LIGHT, and broken underlining represents a GREEN LIGHT. The unmarked or default mapping between intonation structure and the traffic-light system for turn taking is thus ‖ (pre-head) ' (head) ^tonic syllable (tail) ‖.

In lines 2, of Extract 1, Robin starts talking after the 'green light' from his mother. In lines 4 and 6 he starts straight after a yellow light, without waiting for the green light that would be signalled by a pause or an intonational tail. This suggests that Robin is aware when her turn has ended and that this awareness derives, at least in part, from prosodic cues. In the same way, we can see his mother responding to Robin's single word utterances in lines 2 and 4 as complete turns: following his utterance, she immediately starts her own turn (l.3, 5). In both line 2 and line 4, Robin's single word utterance is delivered with a rising falling pitch contour that can be heard as equivalent to the rise-fall tone of Southern British English. It can be inferred that his mother's behaviour, i.e. starting to talk, gives Robin feedback that this use of pitch (rise-fall to the bottom of his pitch range) is one effective way of showing others that he has finished his turn.

Lines 6 and 7 provide further evidence that this is the case. Robin produces another single word, SMOKE, with the same rise-fall pitch. As the transcript indicates, he seems to have given Mother the green light. In line 6 Mother starts to speak, but then Robin continues with 'fafa' (FUNNEL). Finding herself talking in overlap with R, Mother immediately stops talking. Finding that Robin has also stopped, she then restarts (l.9), recycling the turn that was broken off in line 7. We can see that this interactional problem was caused by Robin breaking a traffic light rule: he continued to talk, having signalled that he had stopped – rather like stopping one's car at a red light, then setting off again before the lights have changed. The result is a crash – they end up talking at the same time.

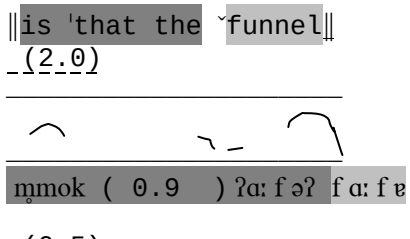
Following the crash, the interaction takes some time to recover (l.8-16). In line 9, Mother presents an interpretation of what Robin might have been getting at in line 6. She tries to get Robin to acknowledge this. Eventually in line 17 Robin produces a new turn. Although lexically and grammatically line 17 looks very similar to line 6, prosodically it is very different. While there is pitch prominence on the first word SMOKE, the second word FUNNEL is produced with lower pitch and loudness – lower compared to SMOKE in line 17 and also lower compared to FUNNEL in line 6.

This new prosodic pattern in line 17 is important for Robin's intonation development. It reflects quite accurately the pattern of prominence in the first tone unit of Mother's turn in line 9, where the Tonic syllable is "smoke" and "comes out of the funnel" forms the tail. This means that Mother is putting the focus on SMOKE, which she is highlighting as the new or important information, while downplaying the rest of the utterance as unimportant. By reproducing this pattern in line 17, Robin is demonstrating an ability to produce a multiword utterance in which the first part is more important than the second. This would have been a contextually fitted turn design at line 6: the 'new' information in line 6 is SMOKE, because this is the answer to Mother's question in line 5; whereas FUNNEL is given, because it is already the established topic of lines 3-5. Finally, in line 18 Mother provides explicit confirmation that Robin has now produced a well-designed turn in line 17; not only with "that's right", but also by reproducing Robin's pitch pattern from line 17, and even omitting the verb 'comes', which makes her utterance more similar to Robin's.

This extract highlights some of the important steps that a child needs to take in order to master the intonation systems of English. At this stage, Robin is beginning to combine single words into multiword utterances, like SMOKE FUNNEL. One of the problems that he faces is how to signal the focus structure of a multiword utterance. Extract (1) shows how, in the course of interaction with his mother, Robin might come to learn how this system works: the demands of Focus conflict with the demands of turn projection, giving rise to a repair sequence.

Extract (1) illustrates a basic problem that confronts a child as he produces his first multiword utterances: how can I say more than one word without being interrupted? If the child produces his first word with a pitch movement that is heard as a Tonic by the adult, then the adult will most likely start talking, as in lines 3, 5 and 7. To prevent this happening, the most effective way is to avoid using a prominent pitch contour on the first word. Research indicates that at this stage, Robin and other children can do this (Corrin, Tarplee & Wells, 2001). This is illustrated in Extract 2, taken from an earlier recording session. Robin and his mother are again talking about the train piece, the funnel and smoke.

Example 2: **Robin RB7**



M: ‖ˇthat's 'right ‖the 'smoke 'comes out of the^funnel‖

R: ɛəaʊʔ (.) jujuzdɛʔ sɛːə
((picks up form board and tips pieces out))

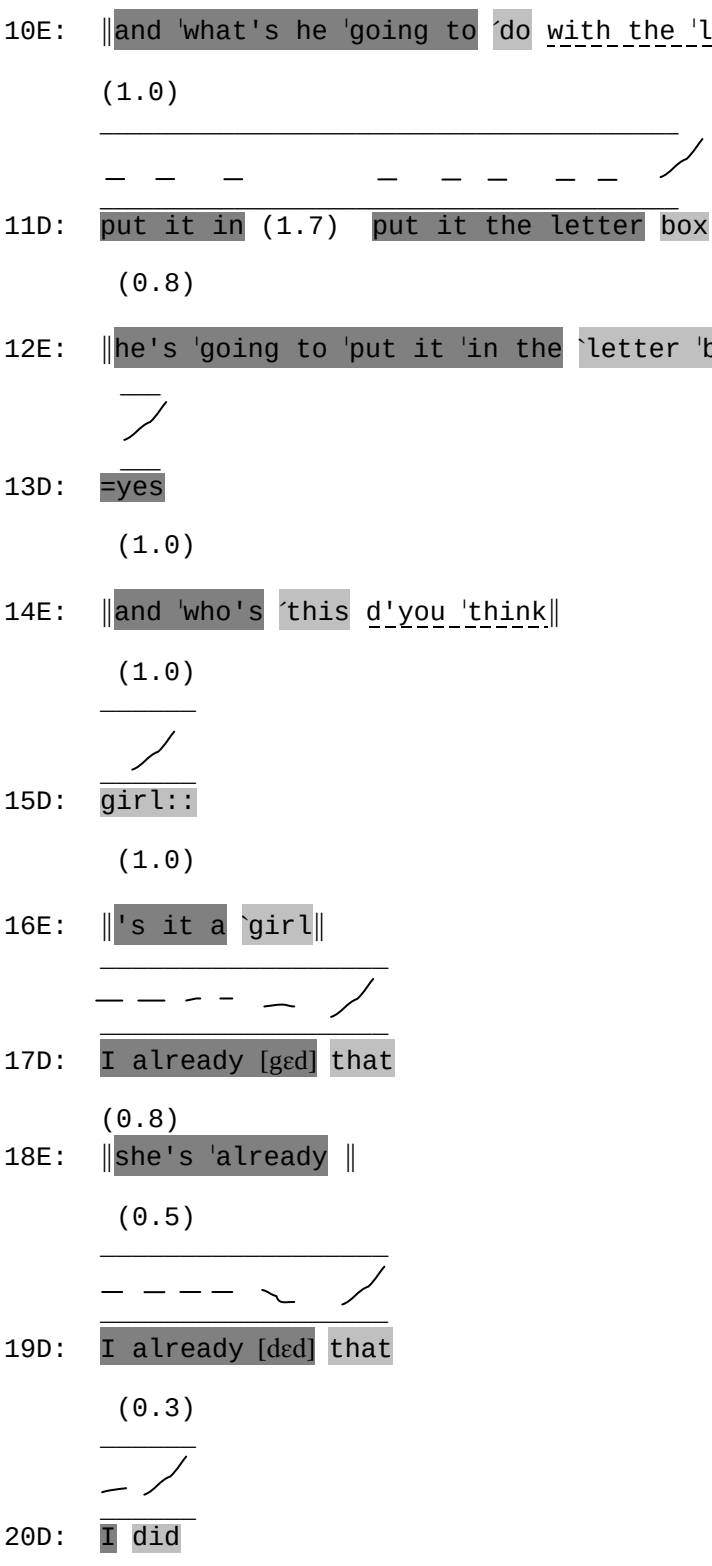
In line 2, Robin produces five syllables. The first three syllables, which on the basis of the mother's response could be glossed as SMOKE OUT OF THE, are located around the middle of his speaking range. The fourth and fifth syllables, presumably representing FUNNEL, are louder and carry a large rising falling pitch movement which reaches the base of Robin's usual pitch range. Mother does not start talking until after the fifth syllable, even though there is a substantial pause between the first and the second. This strongly suggests that Mother is responding to Robin's use of mid level pitch as a turn-holding device: she waits until after the Tonic before she starts her own turn. This is evidence that Robin has produced a Head, thereby creating interactional space to produce a multiword turn.

In summary, Robin is able to access prosodic systems through conversational / play interaction. This ability is important for the development of his ability to construct longer and more complex turns, which contain more complex grammatical structures. It is a collaborative achievement, in which his mother actively participates in various ways: she may initiate repair from Robin, as in lines 9-13 of Extract (1); she may give explicit feedback, e.g. with "that's right"; she may redo Robin's turn, including its prosodic structure, as in the final lines of both extracts; less explicitly, the timing of her turn onsets can demonstrate orientation to Robin's deployment of prosodic features, both in overlapping as in Extract 1, line 7, and in refraining from starting a turn, as in Extract 2, line 2.

3. David: a child with expressive speech and language difficulties

Prosodic development may be impaired in terms of form, i.e. the ability to produce patterns that sound like those of the ambient language. Alternatively, the impairment may be one of function: the patterns may sound appropriate phonetically but the child may use them in such a way that their customary meaning is absent. Finally, both form and function may be impaired. For each of these possible scenarios, the question can be asked: is the child's unusual prosodic behaviour the direct reflex of an underlying deficit, for example a problem with hearing, with the larynx, or with pragmatic understanding? Or is the unusual prosodic behaviour an adaptation to demands of interaction, in the face of other, non-prosodic problems? In this section, insights from typical development, illustrated above from the case of Robin, will be brought to bear on these questions about atypical development.

Example 3: **David: CA 5;04** (Wells & Local, 1993)



David, from the West Midlands of England (near Birmingham), was receiving therapy for his expressive speech and language difficulties, although the therapy was not targeted at prosodic features. At CA 5;04 he was recorded with a speech and language therapy student, who is asking him about a story in pictures. Extract (3), which is a short excerpt from the more extensive

transcript analysed by Wells and Local (1993), illustrates the pattern that David uses on all his utterances. In the picture, a postman is holding a letter.

David invariably locates the main pitch movement on the final syllable of his turn at talk, and it is invariably a rising pitch of at least 300Hz. Words preceding this final syllable are produced routinely with level pitch around the middle of the pitch range. His turn constructional units can therefore be interpreted as having an invariant Head + Tonic structure, as indicated by the shading in Extract 3. A rising turn-final pitch movement (though of smaller span) is appropriate for declaratives in the West Midlands variety of English which David is exposed to, as is also the case for several other urban British varieties (e.g. Belfast, Liverpool, Newcastle), which are thus unlike Southern British English in this respect. However, the fact that the high rise is the *only* tone evident in David's speech suggests that he lacks the richer set of tones found in the adult West Midlands variety.

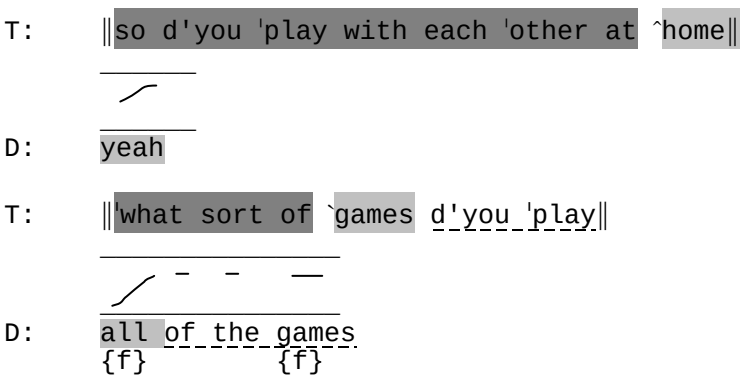
Furthermore, the invariable location of the Tonic on the final syllable of the utterance is atypical of almost all varieties of English, including West Midlands. This has some negative consequences in terms of the prosodic systems of English. For instance, lexical stress of utterance-final words is invariably heard to be on the final syllable. This affects the stress pattern of multisyllabic nouns, including compound nouns, e.g. LETTER BOX, which he produces with final instead of initial stress in line 11. Moreover, the Tonic / Focus system of English is not in evidence: there is little evidence that David can highlight a non-final word through tonic prominence in the way that Robin does at the end of Extract (1), even when this would be expected, as in lines 17 of Extract (3): adult speakers could be expected to place the Tonic on SAID because THAT, in final position, would be deaccented by virtue of being a pronoun. When repeating the same phrase as a repair in line 19, the narrow fall on SAID suggests that he may have some awareness of that pitch movement can convey focus; nevertheless, this pitch movement of c. 70Hz is overshadowed by the rise of c. 300Hz on THAT.

On the positive side, there is evidence that David can mark tone unit boundaries within a longer utterance, as in lines 19 and 20: I DID is produced as a separate tone unit with its own final tonic, separated from the preceding I ALREADY SAID THAT, not only by a pause but also by the final rise on THAT. As this example shows, David is able to map Tone Units onto distinct turn constructional units. Wells and Local (1993) argued that at CA 5;04, David's idiosyncratic prosodic pattern serves to mark the end of his turns at talk in a clear, consistent and unambiguous way, which is useful for him and his co-participants given the unintelligibility of his speech. By clearly signalling the end of his turn at talk, David manages to maintain interactions with others without undue overlap or interruption by co-participants: the head + tonic structure provides David with the interactional space to produce turns that

consist of several words rather than just a single word – an emergent ability that we saw in Robin in Extract (2).

This analysis leads to the hypothesis that David's unusual prosodic behaviour is not a direct reflex of a processing deficit but rather a compensatory strategy, adapting to his low level of intelligibility. This is supported by evidence from recordings made a year later. David's unusual and invariant prosodic pattern at CA 5;4 had been superseded by the more usual one for the West Midlands variety of British English, whereby position of nuclear tone is determined by considerations of information focus, including contrast, as well as turn completion. A brief illustration is provided in Extract (4):

Example 4: **David H: CA 6;04**



In line 4, the pitch prominence is on ALL, rather than on GAMES, as GAMES has already been established as the topic by the student therapist's question in line 3, and David is contrasting ALL with the interlocutor's expectation of an answer in terms of some specific games. Partly as a consequence of such changes, David displayed much greater variety in pitch height and movement (see Wells & Local, 1993 for further exemplification). This was accompanied by a marked improvement in his overall intelligibility, suggesting that increased intelligibility allowed a relaxation of his earlier rigid prosodic system for the projection of turn structure.

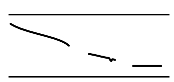
4. Kevin: a child with severe autism

Kevin was diagnosed as severely autistic. Audio and video recordings were made of Kevin at CA 11;04 with members of his family and with his teachers. Detailed analyses of these recorded interactions are presented by Local and Wootton (1995) and by Wootton (1999). The proportion of different vocal behaviours in the recordings was (very approximately) as follows: Delayed echoes (non-communicative): 50%; Labelling responses to questions: 30%; Immediate echoes (in response to questions): 15%; Initiations: 5%. Instances of these last two categories will be discussed, from the point of view of Kevin's use of prosodic resources.

In Extract (5), Kevin and his mother are playing a game that involves throwing dice. Kevin's mother asks him whose turn it is to throw the dice:

Example 5: **Kevin: "Kevin's turn"** (Fragment 11: Local & Wootton, 1995)

```
1 M:  ‖ˈwhose `turn is it‖
      (1.5)
2     ‖ˈwhose `turn is it‖
      (1.5)
3     ‖ˈwhose `turn is it‖
      {     lento      }
      (.)
```



```
→
4 K:   turn is it
       { lento  }

5 M:  ‖ˈwhose `turn is it‖
```

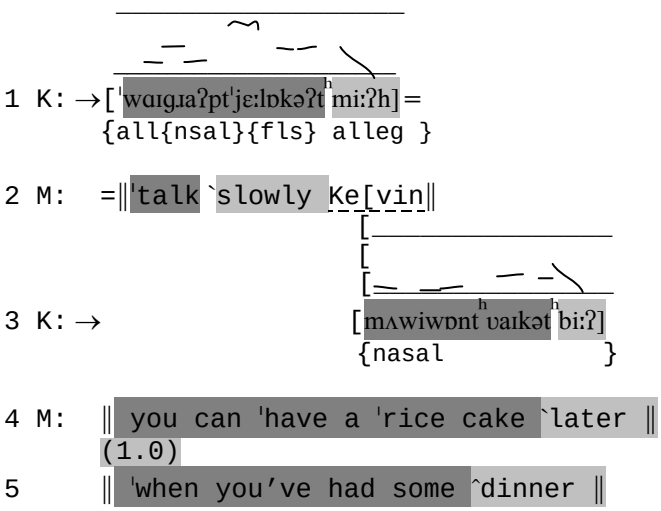
```
→
6 K:  Kevin's turn
      {f}
7 M:  ‖ˇhonest‖
       ((Kevin shakes dice))
8 M:  ‖ˈwhat've you `got Kevin ‖
```

Kevin's mother produces the same question four times. On the first two occasions Kevin does not respond. Her third production is slightly slower. This is followed by an instance of immediate echolalia: Kevin produces the final three words of M's turn, i.e. the Tonic + Tail; the pitch, loudness and tempo features are echoed with great precision. This illustrates that Kevin is able to produce a well-formed prosodic contour of English. Nevertheless, his mother does not treat it as a fitted response: she reiterates her question a fourth time (l.5). In line 6, Kevin produces the same prosodic contour as in his line 4 and Mother's line 5, but with altered lexis: slotting KEVIN into first position means that, with this tonic + tail pattern, KEVIN carries tonic prominence. This presents KEVIN as the new information, which is fitted to the context since TURN is already well established as the topic. Line 6 is treated as a fitted response by Kevin's mother: in line 8 she no longer pursues the same question as hitherto. Instead she queries whether Kevin's response is true. Thus in line 6 Kevin appears to produce a turn that is lexically and prosodically fitted to the context. However, the appropriate tonic may occur by chance: he uses the same pattern as that of Mother's "(whose) turn is it," and his own TURN IS IT. Thus the ability to deploy Tonic placement for the purposes of Focus may not be fully productive for Kevin, being instead parasitic on the immediate local context.

To investigate further how far Kevin is able to deploy prosodic resources productively, it is interesting to consider his initiations, since by definition a

topic initiation will not be parasitic on the preceding context. In Extract (6), Kevin initiates talk in line 1, following a lapse:

Example 6: **Kevin: "rice cake"** (Fragment 1: Local & Wootton, 1995)



The phonetic delivery of the turn in line 1 is quite unusual, with very wide fluctuations in pitch, including a long falsetto vowel, pervasive nasality, and rapid speech rate. The segmental content is not readily interpretable. Despite its speed and unintelligibility, it is noteworthy that the turn is immediately followed by a turn from Kevin's mother, suggesting that she knows that Kevin has reached a TRP. It is likely that the pitch fall to the base of Kevin's range on the final syllable, in combination with lengthening of the final vowel and the strongly aspirated release of the final consonant, contribute to his mother's identification of the TRP. Similar features are found at the end of line 3, which is also followed immediately by talk from the mother. This suggests that despite the atypical prosodic features of line 1, Kevin can at least deploy prosodic resources to indicate the completion of his turn.

Line 3 demonstrates that Kevin is able to modify the prosodic features of his talk: following Mother's request in line 2, Kevin's turn in line 3 is both a little quieter and lower in pitch, though not in fact slower. It also provides some evidence of his orientation to the prosodic features of his mother's talk: the start of his turn in line 3 overlaps the Tail of his mother's turn in line 2. As mentioned earlier, the Tail is vulnerable to terminal overlaps in English conversation, so Kevin's incoming here is not atypical. In general, his incomings are placed at TRPs, providing one strand of evidence that Kevin shows orientation to some basic interactional practices, despite his severe autism (see Local and Wootton, 1995 and Wootton, 1999 for further discussion).

To summarise, Kevin appears able to respond to his co-participant's use of prosodic resources to project turn endings. He himself routinely uses a pitch fall to signal turn-completion. There is some evidence that he is able to

produce well-formed intonation contours, particularly in his echoes. However, this ability is less evident in initiations, suggesting a sequential constraint on his ability to deploy prosodic features for interactional purposes.

5. Conclusions

The case study of Robin, a typically developing boy CA 1;07-1;09, demonstrated that prosodic structure is key to turn construction and therefore social interaction. Prosodic structure, specifically the extension of the Tone Unit, is also the vehicle for his production of multi-element grammatical structures. To learn prosodic structure, the child has access to a system of prosodic traffic lights which adults also orient to. The case studies of David and Kevin showed that atypically developing children with unintelligible speech can display orientation to this system too. It is possible that the association of prosodic prominence and turn projection in children's development is common to most if not all languages, since the regulation of turn-taking is fundamental to all spoken interaction from birth on.

On the other hand, the association of Tonic placement with Focus, and the corresponding de-accenting of material not in focus, is less widespread: for example, it is very common in English and German but much less so in Spanish and French (cf. Cruttenden, 2006). The case study of Robin showed how this language-specific system might be discovered by the child in the course of interaction, facilitated by feedback from more mature co-participants. The case study of Kevin showed that a child with severe autistic difficulties might on occasion appear to use prosodic prominence for Focus, by drawing on the immediate prosodic context provided by the co-participant, although it cannot easily be determined whether this is a productive ability. The case study of David suggested that a child whose speech is largely unintelligible might sacrifice the Focus system for the sake of a robust system of turn projection.

From a methodological perspective, these case studies illustrate an interactional linguistic approach to the study of typical and atypical prosodic development. This approach enables study of the interface of prosody with other linguistic levels. Because the method does not assume that unusual prosody is a direct reflex of an underlying processing deficit, it also enables the exploration of compensatory mechanisms. Compared to test based or experimental methods, the interactional linguistic approach has the advantage that it can be used with children of any age and cognitive level. Finally, it offers ecological validity, as the focus is on how the child develops and exploits prosodic resources in routine talk-in-interaction in everyday life.

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Appendix

Transcription conventions

[ ]	Overlaps, i.e. instances of simultaneous speech. The brackets extend over the transcript of both speakers, and indicate the start and end points of the overlap
=	Latch, i.e. no perceptible gap between one utterance and the next
(.)	Silence of less than 100 ms
(1.4)	Silence (time in seconds)
((nods))	Nonverbal action
{f}	(Forte) loud
{fls}	Falsetto
{all}	(Allegro) fast
{lento}	Slow
{nsal}	Nasal resonance
||… ||	Tone unit boundaries
`	Tone: fall
´	Tone: rise
ˆ	Tone: rise-fall
ˇ	Tone: fall-rise
dark grey	RED LIGHT – next speaker should not start talking here
light grey	YELLOW LIGHT – projects Transition Relevance Place (TRP), so next speaker can start after this
broken underlining	GREEN LIGHT – next speaker may start talking here
SMALL CAPITALS	Gloss of the presumed lexical target of child's production

Relative pitch height and pitch movement are represented iconically between staves representing the speaker's normal pitch range.

IPA symbols and diacritics have their conventional interpretations.