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Acquisition of prosody

Word accents, phrasing, and morphosyntax in a Swedish-English bilingual child at 30–32 months of age

Merle Horne

Introduction

Gisela Håkansson has made many important contributions to the study of language acquisition in both monolinguals and bilinguals (e.g. Håkansson 1998, 2003). The acquisition of grammatical morphology has been an area of particular interest for her, in particular verb morphology and the relation between tense and verb-second word order. The present contribution attempts to illustrate the intimate relation between the acquisition of morphology, syntax and prosody using material from a bilingual child.

Since inflectional and derivational morphology is intimately associated with the distribution of word accents in Swedish (Bruce 1977; Riad 2012), the acquisition of prosodic patterns can be assumed to go hand in hand with the development of the lexicon. Moreover, since prosodic phrasing and syntactic phrasing are closely related (e.g. Selkirk 2000), the acquisition of prosodic phrasing can be expected to develop as postlexical and syntactic structures are learned.

Peters and Strömquist (1996) have shown how the acquisition of morphology in a monolingual child is tied to the development of Accent 1 and Accent 2. The alternation between Accent 1 and Accent 2 in words with the same stem does not occur until the definite and plural suffixes in nouns (e.g. *bilen*₁ ‘the car’ – *bilar*₂ ‘cars’) and verb inflections (*kommer*₁ ‘comes’ – *komma*₂ ‘to come’) are learned (Accent 1 and Accent 2 will be represented with the subscripts ₁ and ₂). The present contribution aims at presenting data from a bilingual child that further illustrates the dynamic period in acquisition around 2.5 years of age where alternation between Accent 1 and Accent 2 in nominal and verbal morphology is well on the way to being mastered by the child. The bilingual data provide clues to the child’s on-line processing of words into stem+affix by e.g. the use of Swedish affixes on English stems, as well as in the generalization of regular affixes to irregular stems. The understanding by the child of the affix/word accent relation at 30–32 months

of age will be seen to be manifested not only by the use of correct alternations between Accent 1 and Accent 2, but also by metalinguistic reasoning which shows hypothesis-testing regarding grammatical affix/word accent mapping. An interesting phenomenon in the material is the prosodic status of the infinitive form of the verb, which appears to have an Accent 1-like form at this stage. Although the acquisition of word-accent distribution has come a long way at 32 months, the material seems to indicate that prosodic phrasing, i.e. the grouping of word-accent and boundary tones into intonational patterns that are found in the adult language (see e.g. Horne 1994; Roll 2009; Myrberg 2010) is something that is still not at the target level at this early stage of development.

The bilingual child

The material in the present study comes from recordings of a boy (whom we will refer to as “Jesper”) between the ages of 30 and 32 months. He is a simultaneous bilingual speaker (Viberg 1987), i.e. he was exposed to both English and Swedish (central Swedish variety) in the home. Swedish was, however, the dominant language (Arnberg 1981; Håkansson 1998), i.e. Swedish, was the language most often heard and used with playmates, Swedish relatives, nanny, friends of the family and was the language most often used by the boy in conversations. The data used here (approximately 250 Swedish utterances) were recorded at home in just such bilingual interactions. Although Jesper grew up in southern Sweden, he acquired a central variety of Swedish prosody, most likely modelled after the prosody of his father. We will assume therefore that the prosodic patterns that Jesper heard in his father’s speech in the home served as the main input for the prosody model that he developed.

Swedish word accents

In Swedish, words are associated with one of two word accents (Bruce 1977, 1986). In Central Swedish, which can be assumed to be Jesper’s prosodic model, Accent 1 is characterized by a low tone (L*) at the beginning of the stressed vowel, whereas Accent 2 is realized with a high tone (H*) at the beginning of the stressed vowel. This contrast is illustrated in Figure 1 with examples produced by Jesper’s father.

According to Bruce (1977), the difference between Accent 1 and Accent 2 involves a difference in the timing of the same basic tonal contour with the segmental string (see Figure 2). Given this interpretation, it could be thought that one accent could be derived from the other on the basis of different timing of the tones with the segmental string. As has been shown by Peters & Strömquist (1996), Accent 2 is acquired first by monolingual children.

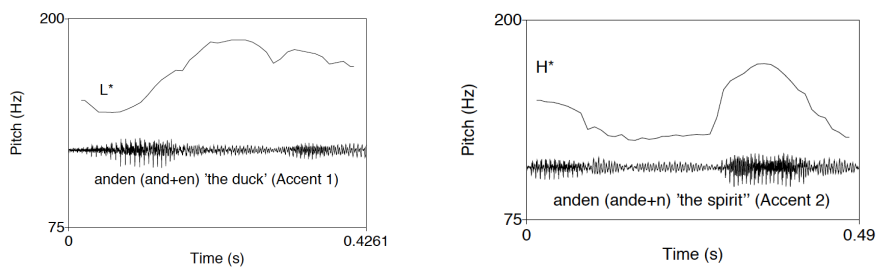


Figure 1. Left: F0-contour and waveform for the Accent 1 word *anden* 'the duck'. Right: F0-contour and waveform for the Accent 2 word *anden* 'the spirit'.

This being the case, it could then be thought that Accent 1 could possibly be acquired when the child perceives the crucial timing difference with respect to the stressed vowel and adjusts the tonal contour so as to associate it earlier with respect to the segmental string. The present data provide some indication that this could possibly be the case (see in particular Figure 5), but more extensive investigations are necessary in order to determine the mechanisms involved in learning the timing distinction between the two word accents. Perception and production of the prominent focal accent ("sentence accent rise" in Bruce 1977 (see Figure 2)) is mastered very early, but the timing difference of the word accent associated with the stressed syllable no doubt becomes finer tuned when the acquisition of grammatical affixes begins, since children then are focused on the form of the affixes and perceive that different suffixes are correlated with different word accents on the same stem, e.g. *boll*+*en*₁ 'the ball', *boll*+*ar*₂ 'balls'; *klipp*+*er*₁ 'cuts', *klipp*+*te*₁ 'cut (past tense)'.

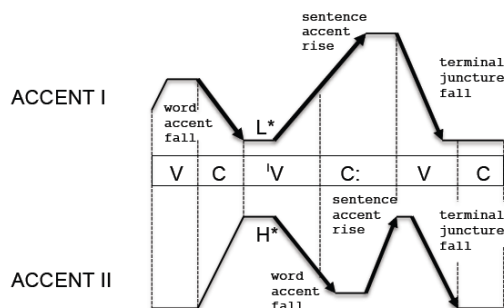


Figure 2. Timing difference of same basic tonal pattern in the realization of Accent 1 and Accent 2 in relation to the CV-tier. Note the low tone at the beginning of the stressed vowel ('V) in Accent 1 and the high tone at the beginning of the stressed vowel in Accent 2 (adapted from Bruce 1977 and Bruce 1986).

When are word accents acquired?

According to Plunkett & Strömquist (1992), the word accent distinction is not mastered completely until around the age of 4 years. Accent 2 is acquired first (often before 2 years of age) in Central Swedish, and this has been assumed to be due to its perceptual salience (Peters & Strömquist 1996). Accent 2 is realized on words with at least two syllables and the two high peaks in prominent (focused) Accent 2 words (most often utterance-final) make them very salient for the child. Monosyllables always have Accent 1. Due to tonal crowding, Accent 1 monosyllables in utterance-final position are sometimes realized with a tonal contour that resembles a non-prominent Accent 2 (i.e. H+L a prominent “sentence accent” or focal high tone followed by a low boundary tone) as is illustrated in Figure 3.

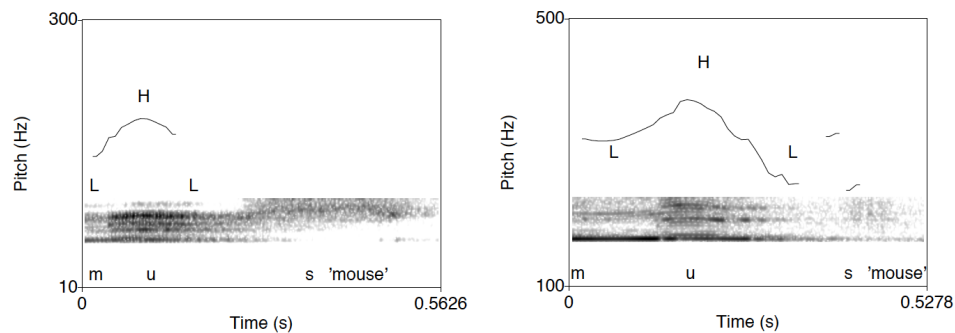


Figure 3. Left: F0-contour and spectrogram for an Accent 1 word (*mus* 'mouse') realized in utterance final position by Jesper's father. Notice that the second half of the vowel (-u-) is associated with a "sentence accent"/focal H-tone and a final L boundary tone. At an early age, this H+L pattern could perhaps be interpreted by the child as the same pattern as an Accent 2 (non-prominent) word accent. Right: Same F0 pattern produced on *mus* 'mouse' realized in utterance-final position by Jesper.

In the language acquisition process, Accent 2 is early generalized to Accent 1 words. There are many reasons for this. One reason is no doubt its salience (Peters & Strömquist 1996). Another is the frequency of a phonetic H+L contour in utterance-final ("sentence accent") position both on prominent (focused) Accent 2 words and monosyllabic Accent 1 words (see Figure 2) boundary tones). A further contributing factor is that frequent Accent 1 words are often monosyllabic modal or base verbs (*är* 'is', *har* 'have', *vill* 'want', *kan* 'can', *ska* 'must') that occur in phrase-internal position where they are non-prominent or deaccented (Riad 2012). Thus the perceptual salience of Accent 1 words in utterance-internal position is considerably lower than that of Accent 2 words, thus making it no doubt more difficult for the child to

determine their target form. At 30–32 months of age, however, when the acquisition of nominal and verbal morphology is well underway, as is the acquisition of different syntactic structures, the recordings used in the present study show evidence that Jesper is well underway to mastering the mapping of word accents to different morphosyntactic structures.

Morphosyntax at 30–32 months

The recordings reveal that Jesper at 30–32 months had reached a stage in his acquisition of Swedish which seems to be comparable to that of other children at the same age (see e.g. Plunkett & Strömqvist 1992). As regards noun morphology, Jesper used the singular definite suffixes *-en* and *-et*, as well as the plural suffixes *-ar*, *-er*, and *-or*. The processing of the plural suffix *-ar* as an independent morpheme is observed for example in the extension of the ending to form the plural of irregular forms such as *hjul* ‘wheel(s)’ > *hjul+ar*. The singular definite ending *-en* is also used on English words, e.g. *pencil+en* ‘the pencil’, *piano-n+en* ‘the piano’ (with insertion of an intervocalic *-n-*).

As regards verb morphology, present tense forms from different declensions are common at 30–32 months: *komm+er* ‘come(s)’, *raml+ar* ‘fall(s)’, *ork+ar* ‘manage(s)’, *blöd+er* ‘bleed(s)’, *rid+er* ‘ride(s)’, *prat+ar* ‘speaks’, *läs+er* ‘read(s)’, *bo+r* ‘live(s)’, *hö+r* ‘hear(s)’. Imperative forms also occur, e.g. *hämt+a* ‘fetch’, *titt+a* ‘look’, in addition to infinitive forms. Future tense forms using *kommer att* ‘going to’ also occur, e.g. *Du kommer inte att lyssna på Jesper* ‘You are not going to listen to Jesper’.

Above the lexical level, Jesper is observed to produce many different constructions with modal verbs + infinitive, e.g. *vill* + infinitive: *Jag vill rita en segelbåt* ‘I want to draw a sailboat’; *måste* + infinitive: *Jag måste betala* ‘I have to pay’; *kan* + infinitive: *Du kan ringa* ‘You can call’; *får* + infinitive: *Du får låna den boken* ‘You can borrow that book’. Even constructions with preplaced adverbs and non-canonical (Adv V S (O)) word order are observed, e.g. *Så/Nu kommer jultomten* ‘So/Now Santa Claus is coming’; *Då har han presenter* ‘Then he has presents’; *Där bor farmor och farfar* ‘Grandmother and grandfather live there’. Syntactic constructions involving topicalization are also produced at 30 months: *Nej, det gör pappa* ‘No, Daddy does that’; *En sån ska jag ha* ‘I want one of those’. Even question word order is produced: *Kan vi släppa ut honom?* ‘Can we let him (=Santa Claus) out?’; *Finns det flera här?* ‘Are there several here?’

The recordings from 32 months contain relative clauses, e.g. *Vad är det som fastnar där?* ‘What is it that gets stuck there?’ as well as subordinate adverbial clauses, e.g. *När jag fyller år då ska jag gå i skolan* ‘When I have my birthday, then I will go to school’. Productive compounding, thought to be correlated to the acquisition of relative clauses (Plunkett & Strömqvist 1992)

is also observed at 32 months, e.g. *elefantpresent* 'elephant-present', i.e. a present that is an elephant.

Prosody at 30–32 months

The use of inflectional morphology leads to morphophonological alternation between Accent 1 and Accent 2: *bil+en*₁ 'car +def.sg.', *bil+ar*₂ 'car+s (pl)', *komm+er*₁ 'come+s' – *komm+a*₂ 'come+inf'. Therefore, at 30–32 months, one expects, and indeed finds evidence for the child's association of the different word accents with different grammatically inflected forms. Figure 4 shows present (*gör*) and preterit (*gjorde*) forms of the verb *göra* 'to do' associated with Accent 1 and Accent 2, respectively.

In addition to the spontaneous production of morphophonological alternation between the two word accents, additional evidence for the processing of inflectional morphemes as independent units comes from utterances where a verb stem is mapped onto different possible suffixes and word accent patterns. For example, on one occasion, Jesper seems to be involved in metalinguistic reasoning, testing different possible verb forms to express the present tense of the verb *hålla* 'to hold' and produces the utterance: *Inte hålla... håller... *hållar* 'Not to hold... holds holds' with different word accent patterns. The infinitive form *hålla* 'to hold' has an Accent 1-like pattern with a L at the beginning of the stressed vowel. This is a common accentual pattern for infinitives in the speech of Jesper at this age (see also below for a further discussion of infinitives; see also Figure 5). In the present tense form, *håller* 'holds', there is also a L in the stressed vowel, although not as early as in the infinitive. In **hållar* 'holds' (non-target suffix *-ar*), there is a low tone at the beginning of the stressed syllable with a steep rise that then falls in the stressed vowel. The suffix *-ar* is associated with a prominence (focal) H tone. Thus the Accent 2-like contour on **hållar* provides evidence for the child's association of the suffix *-ar* with Accent 2.

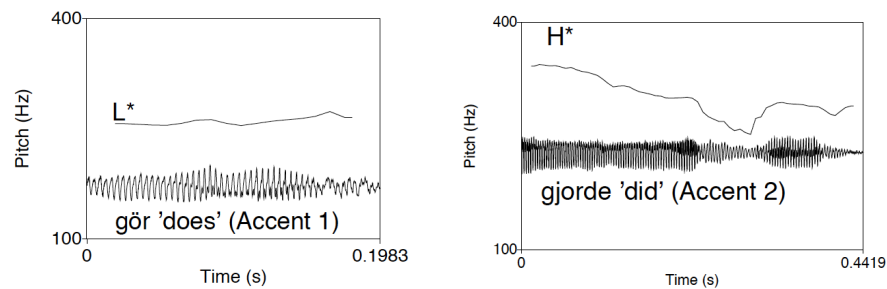


Figure 4. Left: F0-contour and waveform for the present tense form *gör* 'does' (Accent 1). Right: F0-contour for past tense *gjorde* 'did' (Accent 2) produced by Jesper (30 mo.).

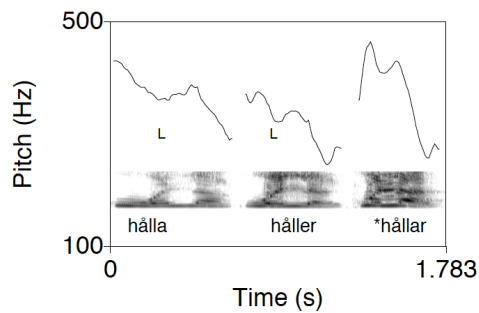


Figure 5. Three different forms of the verb *hålla* 'to hold' produced by Jesper (30 mo.) Left: *hålla* (infinitive) with a L tone at the beginning of the stressed vowel, and with the preceding high in the onset of the syllable (note the voiced *h*); Center: *håller* (present tense) with an Accent 1 contour; preceding high in the syllable onset (voiced *h*); Right: **hållar* (non-target suffix *-ar*) with Accent 2-like contour.

The earlier timing of the accentual contour on the other forms perhaps indicates that the child associates the present tense suffix and infinitive form with a different timing of the word accent pattern (see also Figure 2).

Evidence for the understanding of the present and preterit tense affixes as independent morphemes is seen in their productive use to build new verbs from e.g. interjections. For example, on the basis of the interjection *Pang!* 'Bang!' (sound of a pistol), Jesper creates the forms *pang+er₁* 'bangs' and *pang+de₂* 'banged' with alternation between Accent 1 in the present tense form and Accent 2 in the preterite tense form (see Figure 6). Further evidence for Jesper's processing of verbal tense morphology is seen in the attachment of the regular *-de* preterite suffix to irregular verb-stems such as *kom* 'come' > *kom+de₂* 'came' with concomitant association of Accent 2 to the stem.

Indication of the independent processing of the infinite marker *-a* (as well as the singular definite suffix *-en*) is seen in its use together with English lexical items, e.g. *read+a* in utterances containing modal verb + infinitive constructions like *Kan du reada monkeybooken?* 'Can you read the monkeybook?' What is interesting at this stage, however, is that it is not obvious that the infinitive marker is associated with the target Accent 2. Rather, the infinitive, which occurs most often in utterance internal position is most often associated with a tonal pattern that resembles Accent 1 (see also above, Figure 5). Perhaps this is due to the fact that infinitive forms which are often utterance internal are often realized with Accent 1 or deaccented in adult speech in e.g. verb-particle constructions like *följa med* 'come along', *släppa ut* 'let out', *lyssna på* 'listen to' (see Riad 2012). Indeed, following Christensen (2003), infinitive forms, as opposed to imperative forms, can be regarded as accentually "neutralized" forms of present tense forms (e.g. *följer₁* 'follows' and *ritar₂* 'draws'). In one instance in the present data, the present tense (*följer* 'follow') is used instead of the infinitive form (*följa* 'to

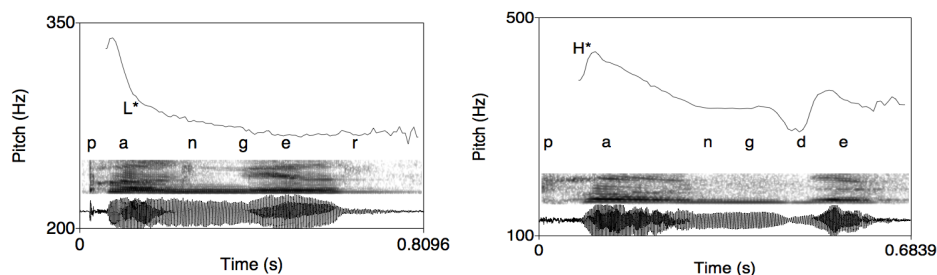


Figure 6. Left: F0 contour, spectrogram and waveform for present tense form *pang+er₁* 'bangs' of verb *panga* 'to bang' formed by Jesper from the interjection *Pang!* 'Bang!' (sound of a pistol) Right: F0 contour, spectrogram and waveform for past tense form *pang+de₂* 'banged' of same verb.

follow') in the utterance *Du får følger med mig* 'You can follow me'. Whether this has any connection with the child's association of present and infinitive forms is impossible to say on the basis of the limited data, but the association of infinitive forms with Accent 1 in the present data is rather striking.

At 32 months, prosodic phrasing is something which has not reached the adult norm. Speech rate is also slower than the adult target (ca. 3–4 syllables/second) in relation to the adult target (ca. 6–7 syllables/second) in spontaneous speech. Prosodic phrases thus contain fewer words than in adult speech. While right-edge prosody is very adult-like, utterance-internal prosody is still under development. This can be seen quite clearly, e.g. in the production of compounds. In the adult target, compounds have an accentual pattern that corresponds to Accent 2, i.e. with a H*L on the first stressed syllable and a prominence rise on the last stressed syllable. In the speech of the two-year-old, the different components of compounds retain their individual tonal patterns. In Figure 7, the difference between Jesper's F0 contour for the compound *segelbåt* 'sailboat' and that of his father are presented. As can be seen, the component morphemes in Jesper's production are both produced with a prominent tone, i.e. both *segel* 'sail' and *båt* 'boat' are realized with a focused word accent. In the adult target, on the other hand, only the final morpheme in the compound, *båt* 'boat', is realized with a focal accent. In the speech of the 2.5 year-old, the general impression is that the tones are rather firmly anchored to the syllables to which they are associated. The kinds of tonal spreading and tonal concatenation patterns that characterize the adult norm are not something that is characteristic of speech at this early age. Although right-edge prosody is very adult-like, utterance initial and internal concatenation patterns (see e.g. Horne 1994; Roll 2009; Myrberg 2010) are still not as in the target prosodic structure.

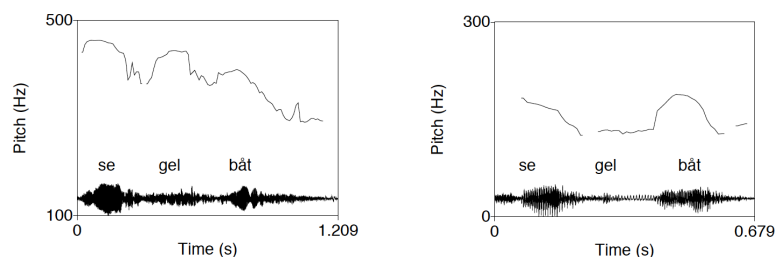


Figure 7. Left: F0 and waveform for the compound *segelbât* 'sailboat' produced by Jesper (32 mo.). Notice that both component morphemes of the compound (*segel* 'sail' and *bât* 'boat') are realized with a prominent tone. Right: F0 and waveform for *segelbât* produced by Jesper's father showing a prominent (focal) Accent 2 pattern on the whole compound.

Conclusion and questions for further study

Although the material investigated in the present study is quite limited, it contains a good number of clues to the on-going process of acquisition of inflectional morphology, syntax and the mapping of word-accent onto lexical structure. The material shows that the bilingual child at 30–32 months is in the process of acquiring inflectional morphology and the morphophonological rules for associating the word accents with different grammatical affixes. Although the right-edge prosody is very adult-like, utterance internal prosody has still not reached the adult target.

In order to be able to arrive at a better understanding of the course of acquisition of the prosody-morphology mapping, it is necessary to conduct more comprehensive longitudinal studies of language acquisition. Controlled data where the same words can be elicited in different morphosyntactic contexts is necessary in order to be able to better track the acquisition of word accents and prosodic phrasing. The present data points to the development of the infinitive form in relation to the present tense and imperative forms as an interesting area of research which could give us a better understanding of the relationship between finite and non-finite forms of the verb. Another area which would lead to more insights into the acquisition of intonation would be a longitudinal study of the development of compound word prosody.

A further area that could be explored using neurolinguistic methods is the question as to when word accents start being used in speech parsing. In ERP (Event-Related Potential) studies using adults (Roll 2009; Roll et al. 2010; Roll et al. 2013), it has been shown that word accents are used predictively in speech processing, i.e. they are used to cue up-coming suffixes. Evidence from the present material and other child data indicate that already at 30–32 months, children seem to be aware of the word-accent/affix relationship. Thus

neurolinguistic studies could provide evidence as to whether they are actually used in language parsing at this age.

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