

LEXICAL STRESS, EMPHASIS FOR CONTRAST, AND SENTENCE INTONATION
IN ADVANCED STANDARD COPENHAGEN DANISH

Nina Thorsen

Preface

A paper with the above title was published in the Proceedings of the Ninth International Congress of Phonetic Sciences, 1979, vol. II, p. 417-423, as a contribution to the symposium on 'The relation between sentence prosody and word prosody'. That paper contained no reference to the literature on intonation in other languages, and no documentation was given for the figures and statements made. - I had intended to publish, in this volume of ARIPUC, a complete account of the material analyzed as well as the results of analyses of questions with emphasis for contrast, conducted after the congress proceedings went to press. However, lack of time prevents this, and a comprehensive version will have to be put off till the next volume of ARIPUC.

On the following pages, the congress paper is reprinted, with a few, very minor, adjustments and with the addition of some footnotes. In an addendum, a couple of points from this paper will be commented upon, and the results of the supplementary analysis of questions with emphasis for contrast are presented.

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(Reprint from Proceedings of the Ninth International Congress of Phonetic Sciences, 1979, vol. II, p. 417-423.)

Due to lack of space, no references will be made to the very considerable literature on intonation in other languages, nor will any extensive documentation be given.

1. A model of Danish intonation

Intonation in short sentences in Advanced Standard Copenhagen (ASC) Danish may be presented as in fig. 1, which is but a model, with the advantages and shortcomings that modeling almost always entails in terms of simplicity and inaccuracy, respectively. It is based on recordings by six subjects, three males and three females, of a rather elaborate material (cf. Thorsen 1978a and section 5.1 below). The qualitative statements which can be read off the figure are perfectly representative of all subjects, but the quantifications involved are, of course, averages, and no one subject behaves as mathematically neatly as the model would have you believe.

A basic assumption underlying fig. 1 is that the complex course of fundamental frequency (F_0) in an utterance is the outcome of a superposition of several components: (1) A sentence component which supplies the INTONATION CONTOUR (broken lines). (2) On the contour is superposed a stress group component which furnishes the STRESS GROUP PATTERNS (full lines). (3) To the resultant of those two components is added, in words containing $st\phi d$, a $st\phi d$ component, rendering STØD MOVEMENTS. However, as $st\phi d$ words had been excluded from the material, the model does not include this particular feature. These first three components are language specific and thus "speaker controlled". (4) Finally, intrinsic F_0 level differences between segments, and coarticulatory variations at segment boundaries supply a MICROPROSODIC COMPONENT, which, at least in non-tonal languages, is not consciously controlled by the speaker, but due to inherent properties of the speech production apparatus and which, therefore, is superfluous

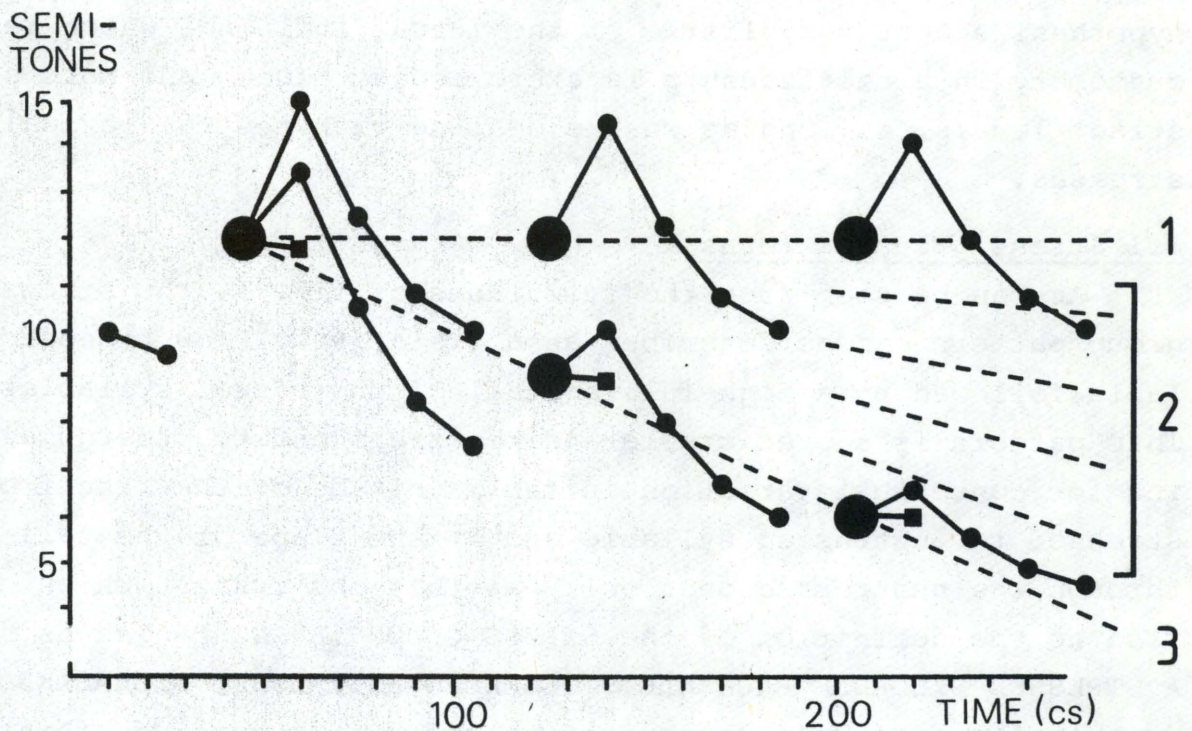


Figure 1

A model for the course of F_0 in short sentences in ASC Danish. 1: syntactically unmarked questions, 2: interrogative sentences with word order inversion and/or interrogative particle, and non-final periods (variable), 3: declarative sentences. The large dots represent stressed syllables, the small dots unstressed ones, and the small squares represent an unstressed syllable being the only one between two stressed ones (see further the text). The full lines represent the F_0 pattern associated with stress groups, and the broken lines denote the intonation contours.

in the model from the point of view of the human speaker.¹ - This concept of "layers" in intonation is anything but original; the triviality of the statement does not, however, deprive it of its validity or its relevance: firstly, it is tremendously useful in the interpretation of Fo tracings (Thorsen, 1979) and, secondly, it has a very direct bearing on the theme of this symposium, 'The relation between sentence prosody and word prosody':

The relation between word stress and sentence prosody (i.e. sentence intonation: duration and intensity are not considered) is physically a very close-knit and intricate one, but we may hypothesize that very little of the mutual influence which is customary in a relationship is exercised at higher and more abstract levels, as long as we are dealing with neutral lexical stresses.

1.1 Stress group patterns

As can be seen from the full lines of fig. 1, the stress group pattern can be described as a (relatively) low stressed syllable followed by a high-falling tail of unstressed syllables. This pattern is a predictable and recurrent entity, though allowing for contextual variation in the magnitude of the rise from stressed to unstressed syllable and in the slope of the fall through the unstressed ones. It was this observation which gave rise to the definition of the STRESS GROUP in ASC Danish as A STRESSED SYLLABLE PLUS ALL SUCCEEDING UNSTRESSED SYLLABLES (within the same, non-compound sentence), irrespective of intervening word or morpheme boundaries, and, as a consequence of this predictability and recurrency, it also brought about the definition of the INTONATION CONTOUR as THE COURSE DESCRIBED BY THE STRESSED SYLLABLES ALONE.

1.2 Intonation contours

The intonation contours tend to vary systematically with sentence type, declarative sentences having the most steeply falling contours, at one extreme, and syntactically unmarked questions having "flat" contours, at the other extreme. In between these

1) It seems as though in tone-languages those perturbations are actively brought within time limits where they will not interfere with the perception of the tonal distinctions in the language, cf. Hombert (1976).

two are found other types of questions as well as non-final periods with slopes that tend to vary in a trade-off relationship with syntax. For a further account of these contours and their perception, see Thorsen (1978a, 1978b).

2. Implications of the model

2.1 Fo movements in syllables

The model does not specify the Fo movements of syllables: the tonal composition of the stress group pattern as one of LOW plus HIGH FALLING allows for a very simple account of Fo movements in vowels and consonants: segments do not carry specific movements (except when stød is involved) but simply float on the Fo pattern, and slight variations in Fo movement would be due then to the fact that segments do not always hit the patterns at exactly the same place.¹

2.2 The course of the intonation contour

(a) When the number of stress groups changes, everything else being equal, so does the slope of a given contour, leaving only the flat ones intact; the constancy presumably lies in the interval between the first and the last stressed syllable, with intervening stressed syllables evenly distributed between them, and not in a certain rate of change.²

(b) When the number of unstressed syllables varies in the stress groups, the stressed syllables will not be equidistantly spaced in time, and the straight lines of fig. 1 break up into a succession of shorter ones with unequal slopes.

Combining the effects of changes of both types leaves us with an infinity of physically different intonation contour configurations. On a higher level in production these variations may not exist, and perceptually they may be obliterated, turning the contours into smoothly slanting slopes, (1) if what we aim at producing and what we perceive are equal intervals between stressed syllables and not the actual slope of the contour, and (2) if we assume that isochrony, be it not a physical reality, is a psychological reality with the speaker/listener.³

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- 1) I am not happy about this formulation, see further the addendum.
 - 2) This assumption turned out to be wrong, at least for longer utterances, cf. Thorsen, this volume.
 - 3) I am inclined to think, now, that assumption (1), as it is formulated here, does not capture the essential fact about perception of intonation contours, see further the addendum.

2.3 Fo patterns of stress groups

2.3.1 Stress groups with more than one unstressed syllable

(a) In statements, the rise from stressed to unstressed syllable is, on the average $1\frac{1}{2}$, 1, and $\frac{1}{2}$ semitone, respectively, in the first, second, and third stress group. In syntactically unmarked questions, the rises amount to 3, $2\frac{1}{2}$, and 2 semitones, respectively. The difference in magnitude of this rise, between patterns riding on different contours is very likely a direct consequence of differences in the level of the following stressed syllable.

(b) The decrease with time in the rise from stressed to unstressed syllable is the same in syntactically unmarked questions and statements, one semitone. This decrease, which is independent of the particular contour, may be seen as a consequence of either of two distinct processes, or of a combination of them. It may be a "voluntary" decrease, i.e. a signal of finality, and/or it may be a physiological phenomenon: the closer you get to the end of the utterance, the less energy is expended and the less complete the gestures will be; either or both phenomena may also account for the less and less steep falls through the unstressed syllables.

If the variation in the Fo patterns with intonation contour and time is physiologically determined, the speaker may be unconscious of it, and the listener may neglect or compensate for it.

2.3.2 Stress groups with only one unstressed syllable

Stress groups with one unstressed syllable will of course be shorter than those with several, a feature which is not reflected in fig. 1. - A single unstressed syllable does not accomplish a full rise-fall when the following stressed syllable is considerably lower than the preceding one, as is the case in statements. Instead it lands on very nearly the same level or slightly below the preceding stressed syllable and, accordingly, the rise-fall is amputated. A full rise-fall may be intended by the speaker and the amputation be due to a shortcoming in the peripheral speech production mechanism. Accordingly, the listener may well re-introduce a rise-fall (this is, indeed, my own subjective impression). But we have here an indication that time (rhythm) overrides Fo when the two are in conflict. On the other hand, there is definitely a tendency for as complete rise-falls as possible. Two unstressed syllables will traverse more than half the fall exhibited by four,

everything else being equal. - These two facts together are yet another reminder that speech is not a card-board structure but a smooth and dynamic process.

2.4 Conclusion

If the assumptions made about production and perception of Fo courses hold water, we are left with two components which physically are highly interactive but on more abstract levels may be invariant, apart from the fact that contours change with sentence type.¹

3. Emphasis for contrast

By emphasis for contrast is meant the extra prominence on one of the syllables in the utterance, used to denote a contrast which may be implicit or may be explicitly stated in the context. I have deliberately avoided terms like 'focus', 'sentence accent', or 'nucleus' because these terms are used, in a number of languages, to describe a phenomenon different from emphasis for contrast: one of the lexically stressed syllables in the utterance will always have slightly greater prominence (realized, very roughly speaking, as a more elaborate Fo movement within or in the environment of that syllable), and if nothing else is specified by the context, it will fall on the last stressed syllable. - A similar phenomenon does not exist in ASC Danish as a thing apart from emphasis for contrast. Whenever and wherever such a slightly heavier stress is introduced, it invariably invokes the impression of contrast. Insofar as we are not faced with incomplete evidence or with a false dichotomy, i.e. one due to differences in concepts, Danish seems to be markedly different from e.g. English, German, and Swedish.

3.1 Contrastive stress and Fo

The following account is based on a material of sentences, uttered in dialogues, where the contrasts were all explicitly stated in the context (but I strongly believe that they would have looked no different had they been implicit). - When emphasis for contrast occurs, it affects the intonation contour as well as Fo patterns.

1) Thus, the sentence and stress group components of the model in fig. 1 may be simply additive from a productional point of view. But for synthesis purposes, the modifications in Fo patterns with contour and time must of course be specified.

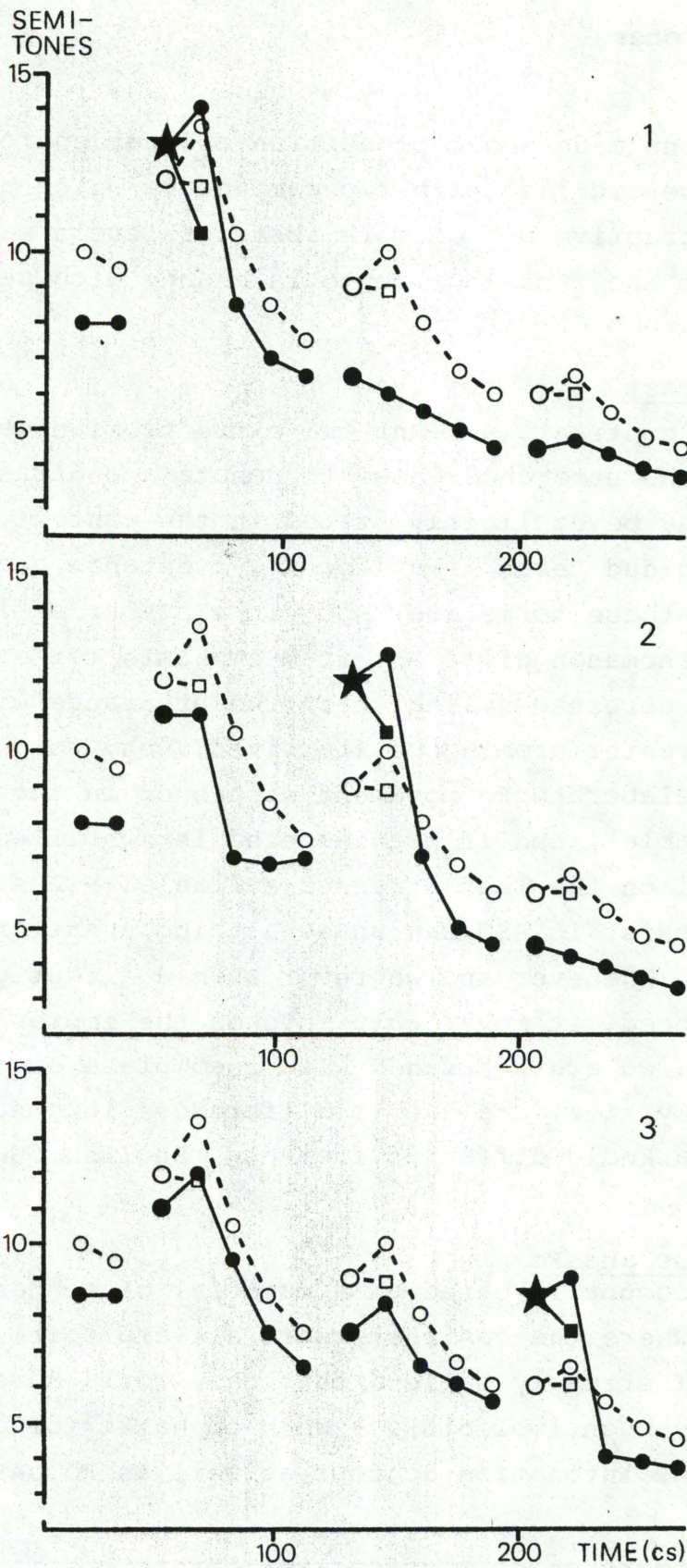


Figure 2

Models for statements with emphasis for contrast on
 (1) the first,
 (2) the second,
 (3) the last stressed syllable, compared to the neutral edition (broken lines and empty dots).

Fig. 2 compares the neutral edition with three statements where the emphasis lay on the first, second, and third lexically stressed syllable. (Durational differences between the neutral and emphatic editions are very slight and there is no doubt that F_0 is the prime cue to contrast, as it is to neutral lexical stress.) The obvious changes introduced in the F_0 course by emphasis for contrast is a raising of the syllable in question (represented by a star), a drastic fall from first to second unstressed syllable, plus a not inconsiderable shrinking of the surrounding F_0 patterns:

(1) When emphasis is on the first stressed syllable, it is higher, the rise to the first unstressed syllable is smaller, and the fall through the following unstressed syllables is steeper than for the neutral case. The levels of the second and third stressed syllables are considerably lowered and the LOW+HIGH FALLING pattern is annihilated in the second and shrunk in the third stress group. The syllables of the second and third stress groups look, tonally, more like a series of unstressed syllables continuing the fall in the first stress group.

(2) Emphasis on the second stressed syllable repeats the pattern of (1), and we also get a certain reduction of the first stress group with a very steep fall from first to second unstressed syllable.

(3) The pattern repeats itself in the last stress group, with a shrinking of the preceding ones as well.

Again we note that a single unstressed syllable does not accomplish a full rise-fall but instead drops well below the preceding emphatic one.

The feature common to the three cases seems to be that the syllable on which the emphasis for contrast occurs must stand out clearly from the surroundings, which is brought about by a raising of that syllable as well as by a lowering of the immediate surroundings, except for the first of several post-tonic syllables. The change is slightly greater in the succeeding than in the preceding F_0 course. During some informal experiments performed with the ILS-system for analysis and synthesis at the Institute of Linguistics, Uppsala University, it appeared that shrinking the F_0 course in the surroundings is sufficient to create the impression of emphasis for contrast. To get emphasis on

the word 'sidste' in the statement 'Det er sidste bus til Tiflis.' (It's the last bus for Tiflis.) it is sufficient to change the rise from 'bus' to 'til' to a level or a slight fall, whereas just raising the stressed syllable of 'sidste' will not do the trick. Likewise, to get emphasis on 'bus', lowering the unstressed syllable of 'sidste' will do and just raising 'bus' does not accomplish anything.

The three Fo courses in fig. 2 look widely different and only vaguely resemble fig. 1 (3), although the utterances still sound declarative. What constitutes the intonation contour in utterances with emphasis for contrast, I hesitate to say at present. They may resemble one-word utterances in that the difference between statement and question lies in the level of and movement within the emphatically stressed syllable as well as in the course of the succeeding unstressed ones (Thorsen, 1978a), or the intonation contour may be extrapolated from, and thus still be definable in terms of, the lexically stressed syllables surrounding the emphatic one. The first solution would be interesting, because it implies that in utterances with emphasis, word prosody takes precedence over sentence prosody, whereas the second solution would make the definition of intonation contour apply to a wider range of utterances.

(The references are assembled after the addendum.)

ADDENDUM

4. Comments and revisions4.1 Re section 2.1 above 'Fo movements in syllables'

The formulation that "segments do not carry specific Fo movements ... but simply float on the Fo pattern" might give the impression that the variation in intravocalic Fo movement is greater than is actually the case. In fact, there are rather narrow limits to the amount of free floating involved and the following account is a more adequate presentation of intrasyllabic Fo movements. A description of vowel movements is sufficient, since the Fo course in voiced consonants seems to be simply a smooth interpolation between the vowels, modified by specific intrinsic Fo properties of the consonant, as the case may be: The course of the unstressed vowels is directly determined by the stress group pattern, being generally falling. The first post-tonic, however, may be rising-falling or even purely rising, depending on the exact timing of the syllable with respect to the Fo maximum. - Short stressed vowels are also generally falling. Long stressed vowels are falling-rising, but the fall is normally as great as or greater than the rise (Reinholt Petersen, 1978). We might ask: why are stressed vowels generally and mainly falling, even though the Fo pattern is on the way up for the post-tonic syllable? and we might seek the answer in an influence from the intonation contour, since we also observe a tendency for a positive correlation between stressed vowel movement and intonation contour slope (the less steep the intonation contour, the less falling the vowel, although the variation in vowel movement is slight). However, I think that the explanation for the mainly falling stressed vowels is to be found in the way stressed syllables are signalled in ASC Danish, being ones that are jumped up from, and a fall will maximize the perceptual distance to the succeeding higher post-tonic. The less steep falls in stressed vowels on less steep intonation contours may be accounted for in terms of the greater rise to the post-tonic, and thus only indirectly to the intonation contour proper.

4.2 Re section 2.2 above 'The course of the intonation contour'

In view of the results of the analysis of intonation contours in utterances of varying length (cf. Thorsen, this volume), I do not think it reasonable to assume that intonation contours must necessarily be perceived as smoothly slanting slopes, i.e. I do not think that the boundaries between prosodic phrase groups, when such grouping occurs, go unnoticed. - Instead, I think that the invariance of intonation contours associated with the same type of sentence or with the same linguistic function and which may be physically different will lie in the degree of over-all downdrift, the perception of which is not crucially dependent on the exact location of the stressed syllables on the frequency and time scales. (See also Pierrehumbert, 1979.)

5. Emphasis for contrast in declarative sentences and syntactically unmarked questions

5.1 Material, subjects, and recordings

The same type of material as was used for the original analysis (Thorsen, 1978a) served here, i.e. nonsense words embedded in initial, medial, and final position in short sentences which are as much alike semantically, syntactically, and rhythmically as possible (for a discussion of the choice of words, see Thorsen 1978a p. 153). The sentences are listed below (they translate as follows: '_____ has shorter syllables', 'The syllables of _____ are shortened', and 'There are shorter syllables in _____', respectively):

1. 'p*ip*i giver kortere stavelser.
2. 'p*ip**ip*i giver kortere stavelser.
3. p*ip*'*ip*i giver kortere stavelser.
4. p*ip*i'*ip* giver kortere stavelser.
5. 'p*ip*ipi giver kortere stavelser.
6. pip'ipi giver kortere stavelser.
7. pipi'ip giver kortere stavelser.
8. 'p*ip*i giver kortere stavelser?
9. 'p*ip**ip*i giver kortere stavelser?
10. p*ip*'*ip*i giver kortere stavelser?

11. Stavelserne i 'p*ip*i forkortes.
12. Stavelserne i pi'*pi* forkortes.
13. Stavelserne i 'p*ipip*i forkortes.
14. Stavelserne i pi'*pip*i forkortes.
15. Stavelserne i pipi'*pi* forkortes.
16. Stavelserne i 'p*ipip*i forkortes.
17. Stavelserne i pi'p*ip*i forkortes.
18. Stavelserne i pipi'pi forkortes.
19. Stavelserne i 'p*ip*i forkortes?
20. Stavelserne i pi'*pi* forkortes?
21. Stavelserne i pipi'*pi* forkortes?
22. Det giver kortere stavelser med 'p*ip*i.
23. Det giver kortere stavelser med 'p*ipip*i.
24. Det giver kortere stavelser med pi'*pip*i.
25. Det giver kortere stavelser med pipi'*pi*.
26. Det giver kortere stavelser med 'p*ipip*i.
27. Det giver kortere stavelser med pi'p*ip*i.
28. Det giver kortere stavelser med pipi'pi.
29. Det giver kortere stavelser med 'p*ip*i?
30. Det giver kortere stavelser med 'p*ipip*i?
31. Det giver kortere stavelser med pi'*pip*i?

The questions, together with the neutral statements, were intended for a control and quantification of one aspect of the model as presented in Thorsen (1978a p. 174): that the magnitude of the Fo rise from stressed to post-tonic decreases with time, but is independent of the particular contour (falling or flat) that the stress group rides upon. But they also serve as a frame of reference for the questions with emphasis for contrast, that were recorded at a later stage, cf. below.

In order to make sure that the utterances with nonsense words do not behave aberrantly, the following sentences were recorded as well ('There are many buses out of Tiflis'):

32. Der går mange busser fra Tiflis.
33. Der går mange busser fra Tiflis.
34. Der går mange busser fra Tiflis.
35. Der går mange busser fra Tiflis.

These 35 utterances, embedded in small dialogues, were mixed with a rather large material that served a completely different purpose (five full pages of reading material in all) and were recorded six times by three phoneticians (two males and one female) and ten times by the author. One of the males speaks a slightly conservative variant of Standard Copenhagen Danish, the other subjects speak Advanced Standard Copenhagen Danish.

This material is the foundation for the paper reprinted above.

Later on, three of the four subjects (excluding the ASC-speaking male) recorded the following material:

36. 'pipipi giver kortere stavelser.
37. pi'pipi giver kortere stavelser.
38. pi'pipi giver kortere stavelser.
39. Stavelserne i pi'pipi forkortes.
40. Stavelserne i pi'pipi forkortes.
41. Det giver kortere stavelser med pi'pipi.
42. Det giver kortere stavelser med pi'pipi.
43. pi'pipi giver kortere stavelser?
44. pi'pipi giver kortere stavelser?
45. pi'pipi giver kortere stavelser?
46. Stavelserne i pi'pipi forkortes?
47. Stavelserne i pi'pipi forkortes?
48. Stavelserne i pi'pipi forkortes?
49. Det giver kortere stavelser med pi'pipi?
50. Det giver kortere stavelser med pi'pipi?
51. Det giver kortere stavelser med pi'pipi?
52. Det giver kortere stavelser med 'pipipi?

The statements and questions where emphasis occurs in the surroundings of the nonsense words would yield a sounder basis

for the quantification of the shrinking of Fo patterns that surround an emphasis for contrast (cf. fig. 2 above).

These 17 sentences were embedded in dialogues and again mixed with a material that served a different purpose, which gave two pages of reading material, that occurred in three different randomizations, each being read twice by the three subjects, i.e. six readings of each sentence were obtained.

The recordings were made with semi-professional equipment in a quasi-damped room and were processed by hard-ware intensity and pitch meters (F-J Electronics), registered on a Mingograph (Elema 800) and measured by hand. - In unidirectional Fo courses with constant slope, only the beginning and end points were measured. In more complex Fo courses, three to six points were measured, in a manner so that the traces could be accurately reconstructed by smooth interpolation through the measuring points. The duration of each segment was likewise measured, to the extent that segmentation could be reliably performed. Fo and time measurements were averaged over the six (ten) recordings of each sentence by each subject, and average tracings drawn. The Fo averages were later converted into semitones (re 100 Hz) and these values were turned into account for figs. 1 and 2 above.

5.2 Results

The bulk of the material has been accounted for in sections 2.3(1,2) and 3 above. What remains is the analysis of questions with emphasis for contrast. This analysis has been completed for only one subject (BH - female), in the sense that the appropriate stylized figures have so far only been turned out for her, but inspection of the "raw" average tracings of the other subjects leave no doubt that the conclusions that may be drawn on the basis of BH can be extended to cover the other speakers as well, and the (slight) deviations among subjects will only affect the quantification involved.

Figs. 3-11 are stylized tracings that compare (a) neutral statements and statements with emphasis for contrast on the first through third stress group (figs. 3-5), (b) neutral questions and questions with emphasis for contrast on the first through third stress group (figs. 6-8), (c) questions and statements with emphasis for contrast on the first through third stress group (figs. 9-11). These figures differ from fig. 2 in that they are the out-

come of a combination of information from several average tracings: each Fo pattern is based on the average of the nonsense words in the appropriate condition. E.g. the neutral statement in figs. 3-5 is pieced together of the over-all averages of the nonsense words in sentences 1-4 (initial position), 11-15 (medial position), and 22-25 (final position), and the statement with emphasis in the first stress group is composed of the nonsense words in sentences 5-7, 39, and 41. The averages over several words are calculated only after the words have been lined up according to the stressed syllables, and they include the following word/syllable ([_og_iΛ] and [_ofΛ]) when necessary to obtain two post-tonics.

On a couple of points BH deviates slightly from the average trends that can be read off the model (fig. 1) and fig. 2: In the neutral question (cf. figs. 6-8), the stressed syllable is slightly higher and the rise to the post-tonic slightly smaller than expected in the second stress group. Therefore, the intonation contour is not completely flat and the progressive decrease in the rise from stressed to post-tonic from first through last stress group is not apparent. (This might be a side-effect of the way the figures have been constructed, being pieced together of average tracings of the nonsense words in initial, medial, and final position in different sentences - although on the whole this procedure seems to be quite satisfactory.)

It is clear from figs. 6-8 that the changes in Fo introduced by emphasis for contrast in questions is analogous to that found in statements: the emphatic syllable gets its extra prominence by an annihilation of the HIGH+LOW FALLING pattern in the surrounding stress groups and by a lowering of preceding ones, if any, as well, cf. figs. 7-8. The raising of the emphatic syllable itself, that we observe in statements (cf. figs. 3-5) is hardly noticeable.

The most obvious difference between questions and statements with emphasis for contrast (figs. 9-11) is in the course of the syllables succeeding the emphatic one: they run higher in questions than in statements. In fig. 9 and fig. 11 there is also a difference in the level of the emphatic syllable, but the order and magnitude of this difference is subject to a high degree of inter-speaker variation (apparent from inspection of the average tracings of the other two subjects who recorded questions with

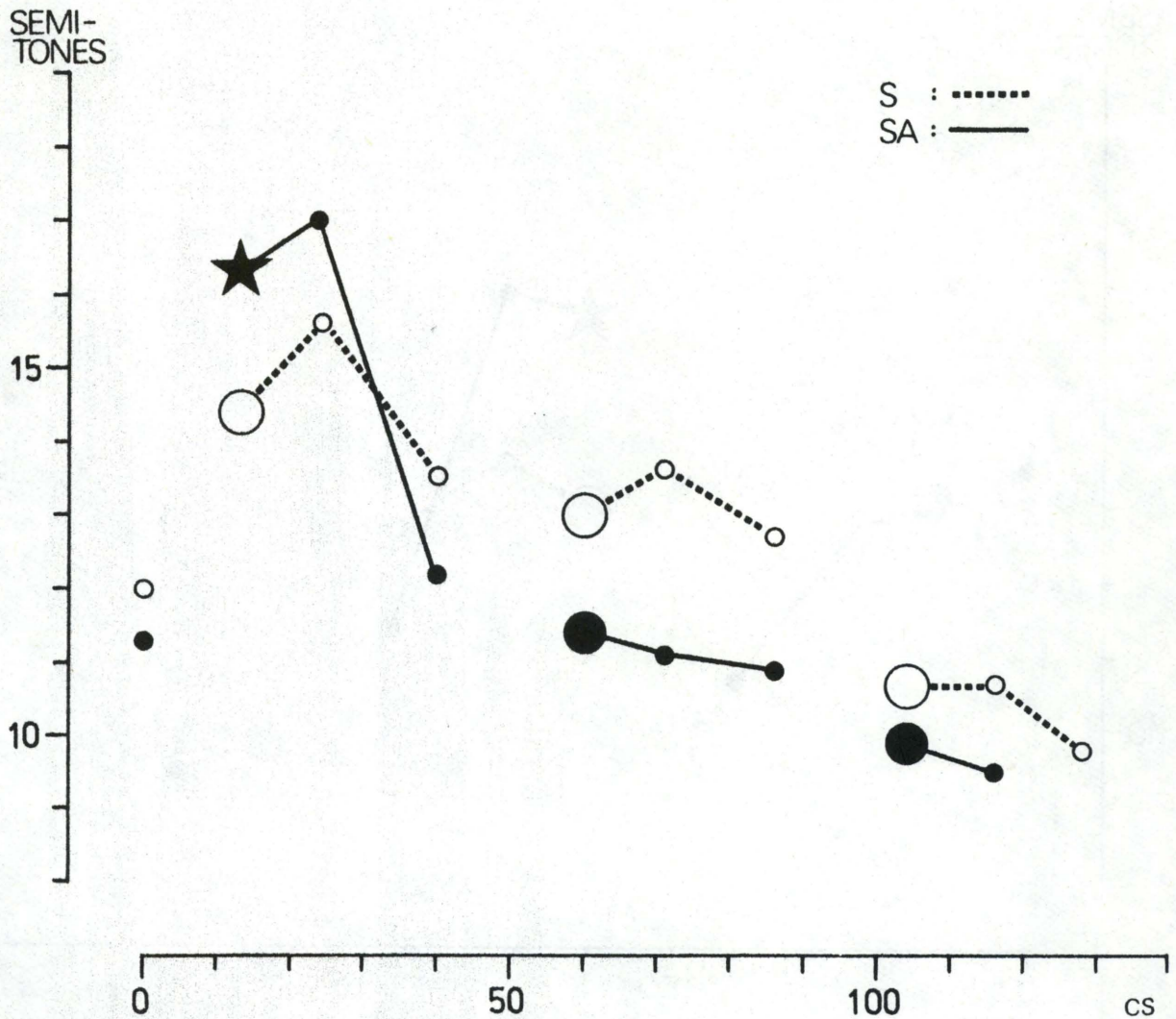


Figure 3

Stylized tracing of a neutral statement (S) and one with emphasis for contrast on the word of the first stress group (SA). S is a combination of the nonsense words in sentences 1-4, 11-15, and 22-25. SA is a combination of the nonsense words in sentences 5-7, 39, and 41.

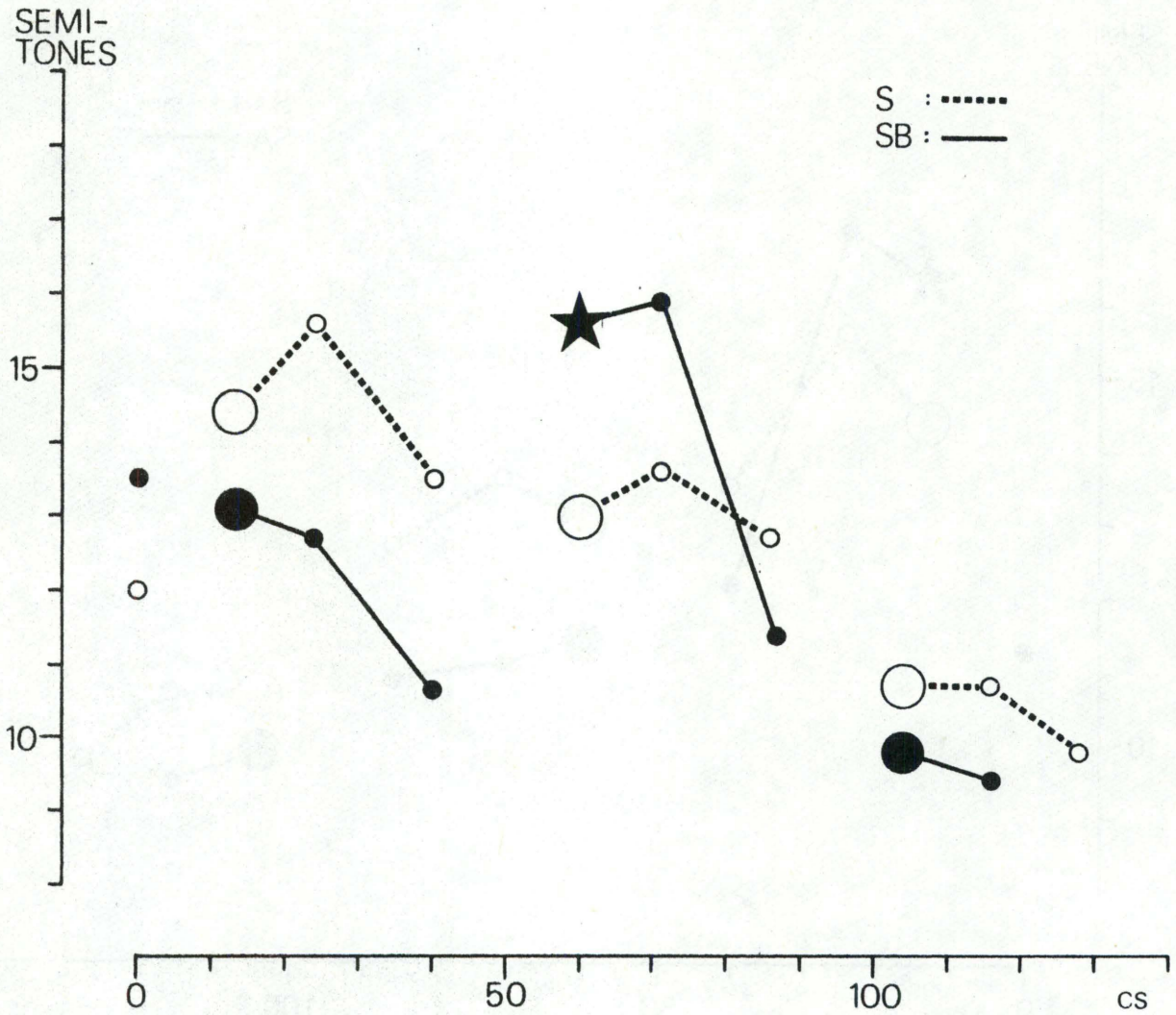


Figure 4

Stylized tracing of a neutral statement (S) and one with emphasis for contrast on the word of the second stress group (SB). S is a combination of the nonsense words in sentences 1-4, 11-15, and 22-25. SB is a combination of the nonsense words in sentences 36-37, 16-18, and 42.

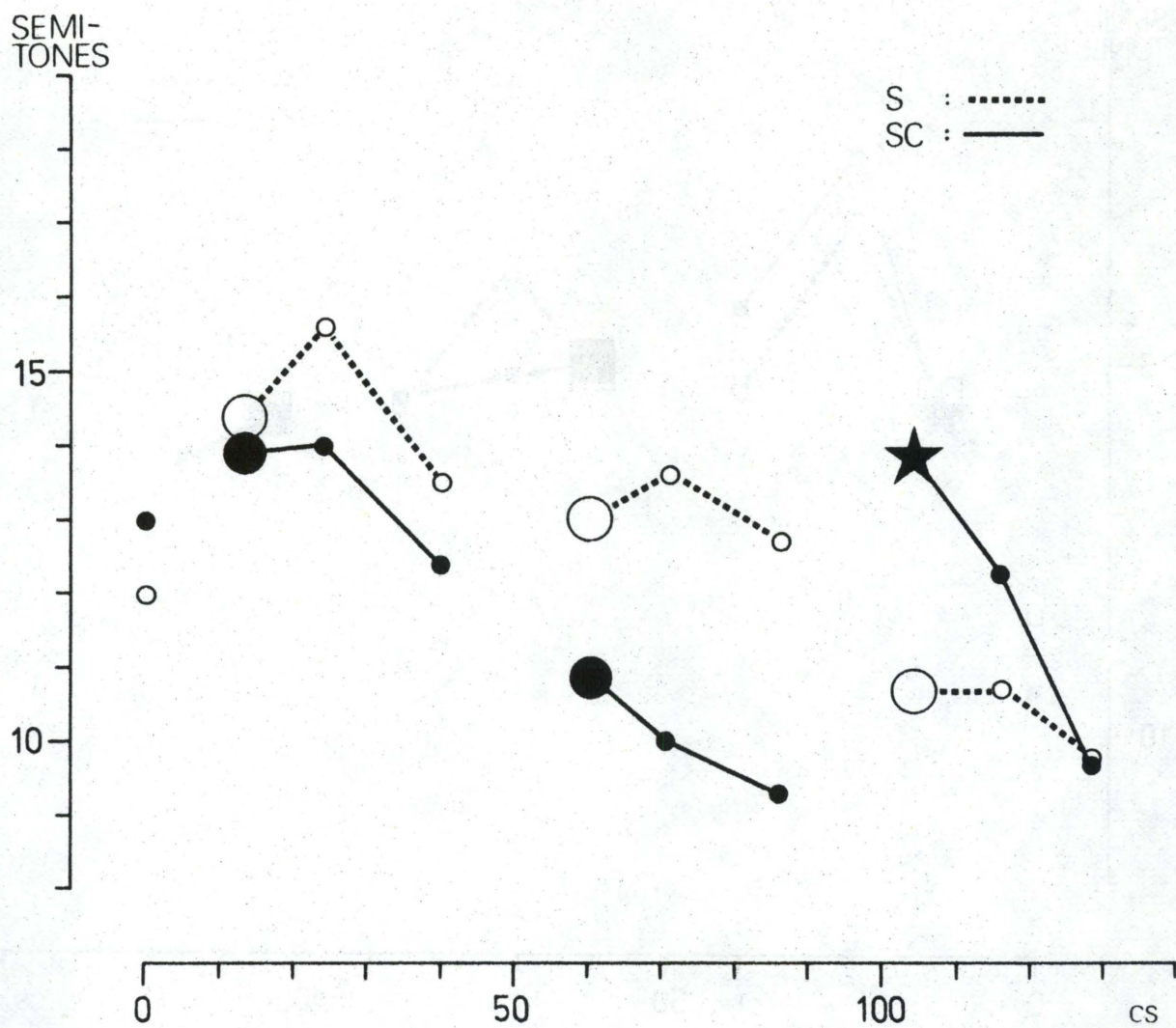


Figure 5

Stylized tracing of a neutral statement (S) and one with emphasis for contrast on the word of the third stress group (SC). S is a combination of the nonsense words in sentences 1-4, 11-15, and 22-25. SC is a combination of the nonsense words in sentences 38, 40, and 26-28.

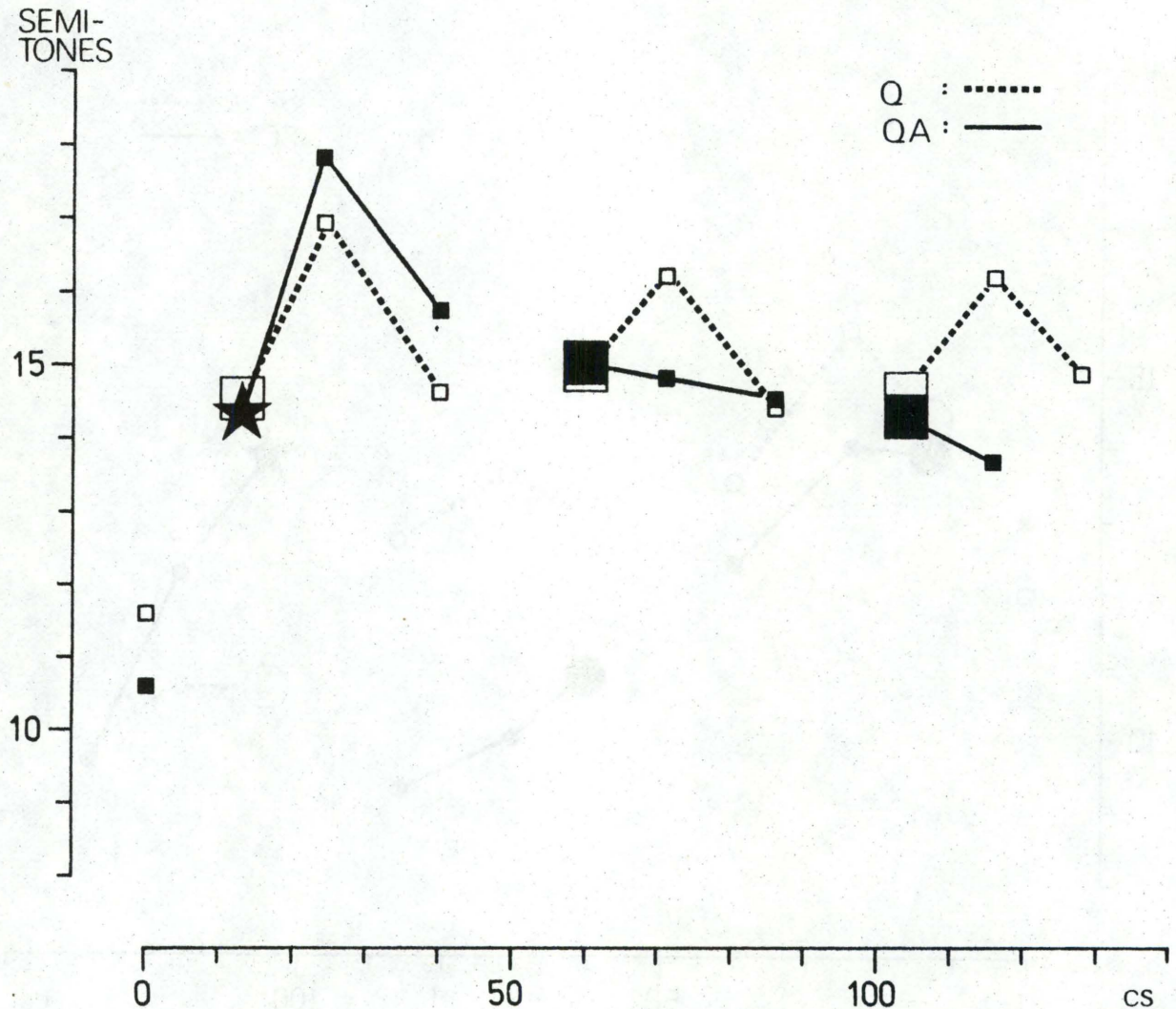


Figure 6

Stylized tracing of a neutral question (Q) and one with emphasis for contrast on the word of the first stress group (QA). Q is a combination of the nonsense words in sentences 8-10, 19-21, and 29-31. QA is a combination of the nonsense words in sentences 43, 46, and 49.

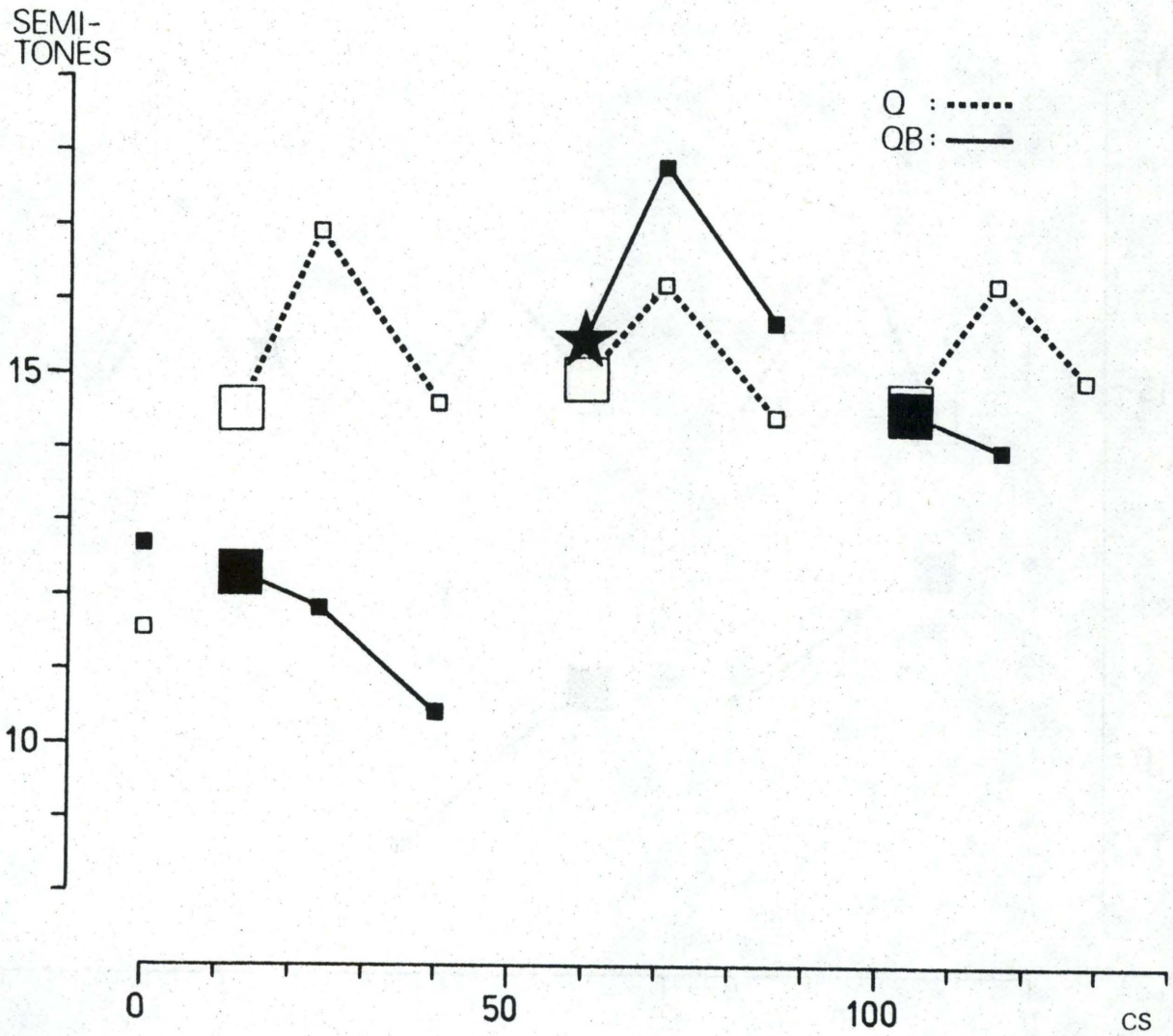


Figure 7

Stylized tracing of a neutral question (Q) and one with emphasis for contrast on the word of the second stress group (QB). Q is a combination of the nonsense words from sentences 8-10, 19-21, and 29-31. QB is a combination of the nonsense words in sentences 44, 47, and 50.

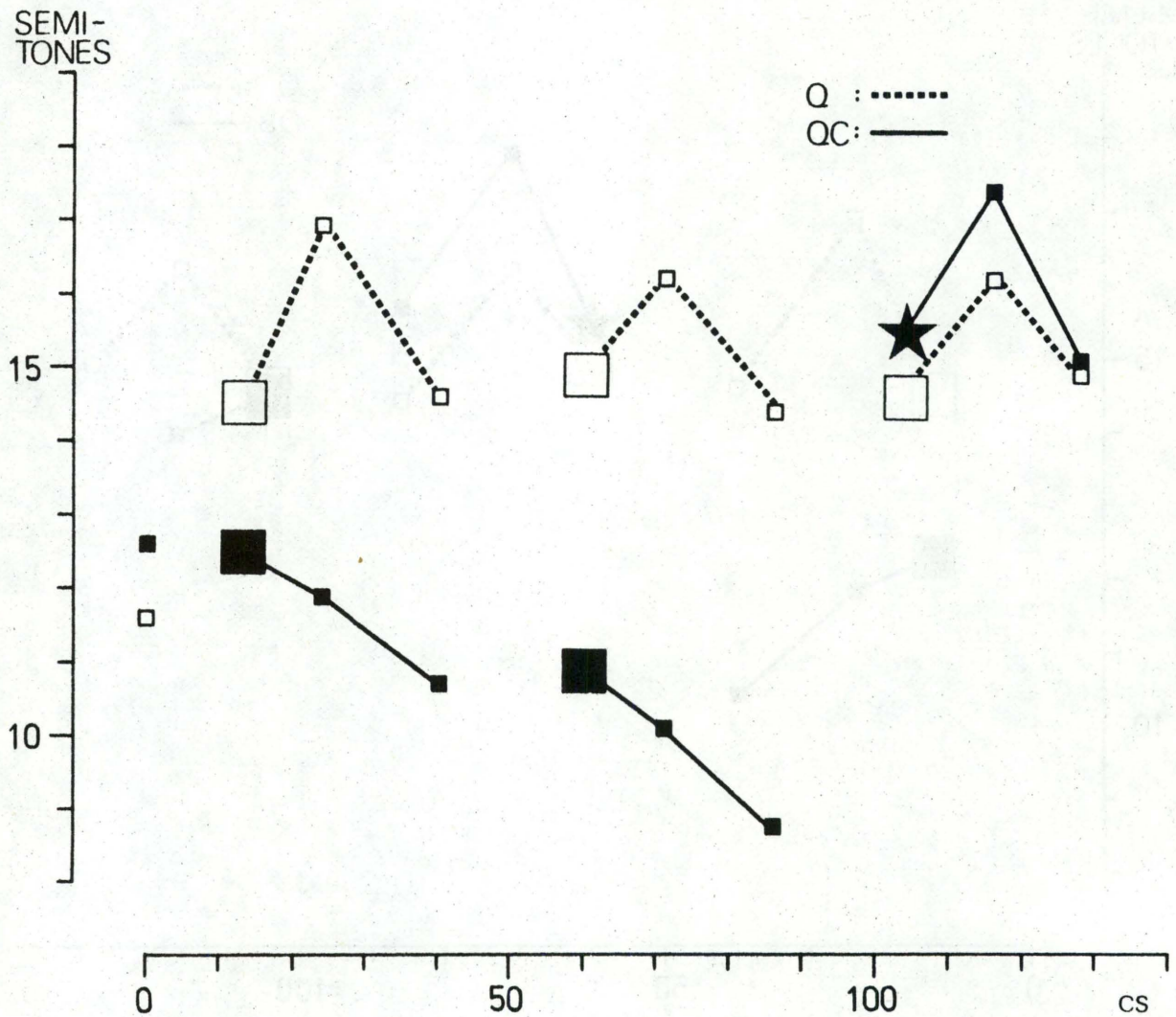


Figure 8

Stylized tracing of a neutral question (Q) and one with emphasis for contrast on the word of the third stress group (QC). Q is a combination of the nonsense words from sentences 8-10, 19-21, and 29-31. QC is a combination of the nonsense words in sentences 45, 48, and 51-52.

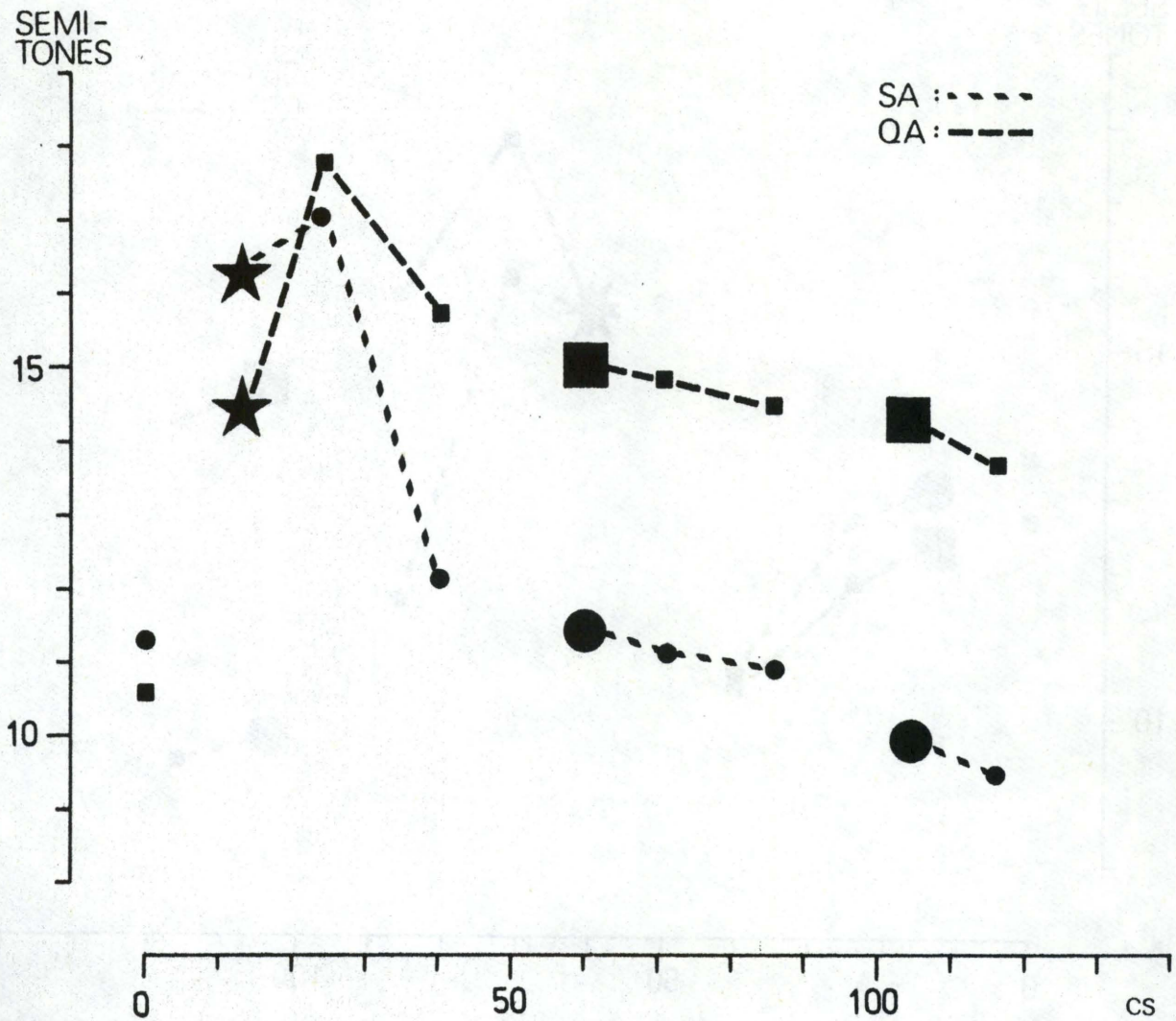


Figure 9

Stylized tracing of a question (QA) and a statement (SA) with emphasis for contrast on the word of the first stress group. QA is a combination of the nonsense words in sentences 43, 46, and 49. SA is a combination of the nonsense words in sentences 5-7, 39, and 41.

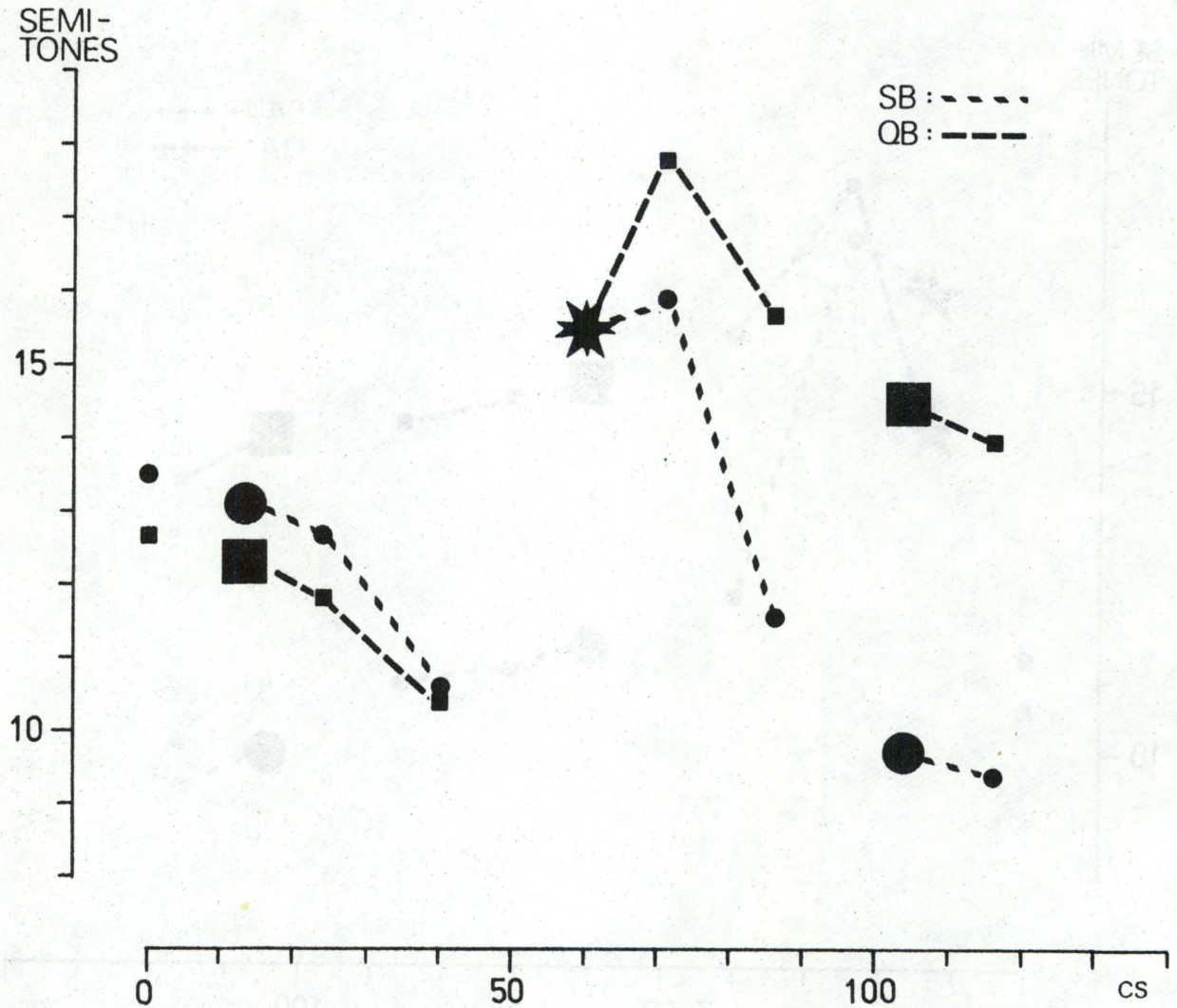


Figure 10

Stylized tracing of a question (QB) and a statement (SB) with emphasis for contrast on the word of the second stress group. QB is a combination of the nonsense words from sentences 44, 47, and 50. SB is a combination of the nonsense words from sentences 36-37, 16-18, and 42.

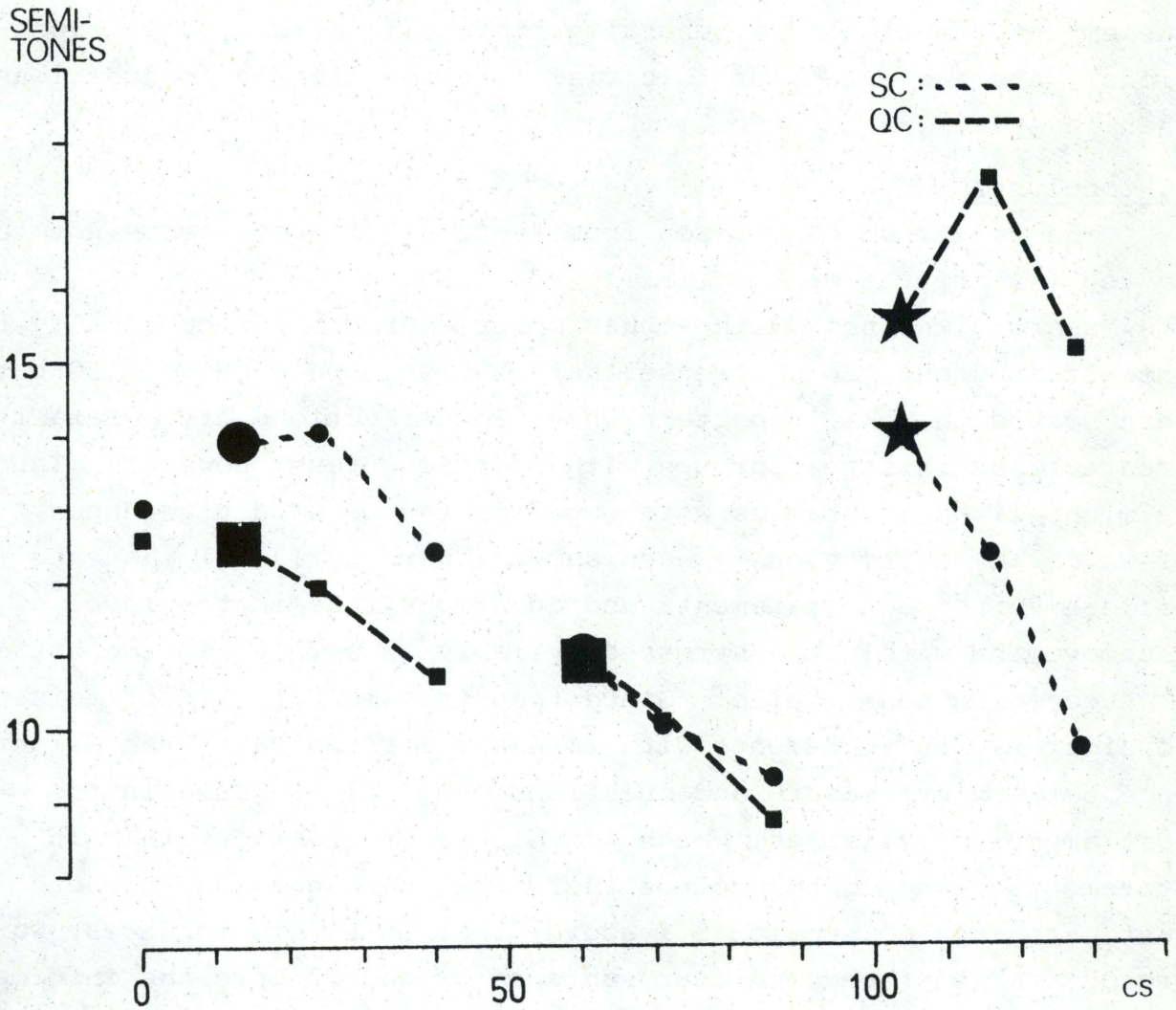


Figure 11

Stylized tracing of a question (QC) and a statement (SC) with emphasis for contrast on the word of the third stress group. QC is a combination of the nonsense words from sentences 45, 48, and 51-52. SC is a combination of the nonsense words from sentences 38, 40, and 26-28.

emphasis for contrast), and this is hardly a salient feature.

The figures do not specify F_0 movement within the vowels, but inspection of the raw average tracings of all three (four) subjects who recorded utterances with emphasis for contrast suggests the following account: The F_0 movement in the vowels preceding and following the emphatically stressed one is invariably falling. The emphatic syllable is generally rising (invariably so in questions), and the extent of this rise is often greater in questions than in statements.

6. Conclusion

The tentative conclusion from section 3.1 above seems not to be too far off the mark:

Short utterances with emphasis for contrast reduce tonally to one stress group, in the sense that only one LOW+HIGH FALLING pattern occurs in them, a pattern whose F_0 deflections are generally greater than in stress groups with neutral stress, however. Thus, we might liken utterances with emphasis to one word utterances, of which it has previously been shown (Thorsen, 1978a) that the difference between statements and questions lies in the level of and movement within the stressed syllable as well as in the course of succeeding post-tonics. Since the stressed syllable is raised considerably in statements with emphasis for contrast, the difference between statements and questions is mainly located in the post-emphatic syllables, which run higher in questions than in statements. We might conclude therefore (as suggested in the last paragraph of section 3.1 above) that in such utterances, word prosody takes precedence over sentence prosody, since the information about sentence type/function is contained within the "emphatic stress group" and not in the ensemble of lexically stressed syllables, as is the case for neutral utterances. But this is neither here nor there. If short utterances with emphasis for contrast are regarded and treated as one word utterances, then the argument about what takes precedence over what is meaningless, precisely because the "word" is simultaneously a complete utterance, i.e. its F_0 course will contain information about the distribution of stressed and unstressed syllables as well as about the function of the utterance, and one does not exclude or take precedence over the other.

References

- Hombert, J.-M. 1976: "Consonant types, vowel height, and tone in Yoruba", UCLA WPP 33, 40-54
- Pierrehumbert, J. 1979: "The perception of fundamental frequency declination", JASA 66, 363-369
- Reinholt Petersen, N. 1978: "Intrinsic fundamental frequency of Danish vowels", JPh 6, 177-189 (also in ARIPUC 10, 1976, 1-27)
- Thorsen, N. 1978a: "An acoustical investigation of Danish intonation", JPh 6, 151-175 (also in ARIPUC 10, 1976, 85-147)
- 1978b: "On the identification of selected Danish intonation contours", ARIPUC 12, 17-73
- 1979: "Interpreting raw fundamental frequency tracings of Danish", Phonetica 36, 57-78
- this volume: "Intonation contours in declarative sentences of varying length in ASC Danish" (paper read at the Autumn Meeting of the Institute of Acoustics, Windermere 4-6th November 1979).