NUSA Vol. 53 (2004)

WORD STRESS IN INDONESIAN: FIXED OR FREE?

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The current research addresses the issue of word stress in Indonesian. Indonesian listeners were asked to rate different (electronically manipulated) stress patterns. They were also asked to indicate on which syllable they perceived the stress. All stress patterns were acceptable to the listeners, but (heavy) prefinal syllables scored slightly higher as stress-bearers than initial or final syllables. We argue from these data that stress in Indonesian is essentially free.

1 INTRODUCTION

In Indonesian word stress is not distinctive. There are no words that contain the same sequence of vowels and consonants but differ in their stress pattern and meaning as a result of that. Traditionally, stress is described as fixed on the penultimate syllable (Alieva, Arakin, Ogloblin and Sirk 1991:63; Teeuw 1978:9). Other researchers hold the view that stress is on the final syllable of the word (Samsuri 1971) or that Indonesian has no word stress at all (Halim 1974:111–113). Schwa is usually regarded as unstressable, but Laksman (1994) argues that schwa can be stressed as well as any other vowel (cf. Odé 1994 for a survey of the literature on stress placement). Phonetically, Indonesian stress is only weakly marked (Teeuw 1978:9). It is, however, considered perceptually relevant; deviations from the correct pronunciation "sound awkward" (Moeliono and Dardjowidjojo 1988:73). Recent research suggests that stress may be essentially free in Indonesian (cf. Ebing 1997:92–95), with the possible restriction that stress on the penultimate syllable is obligatory when this syllable is 'heavy', i.e. closed by a consonant (van Zanten and van Heuven 1997). We are not aware of any reports in the literature on the (relative) importance of syllable weight in Indonesian.

Most authors state that complex words (base plus one or more suffixes; prefixes do not influence the stress pattern) have the stress on the penultimate syllable regardless of word-internal structure (for instance Cohn 1989:176), but De Hollander (1984:27–28) and Alieva et al. (1991:64) claim that in some cases stress is maintained on the penultimate syllable of the base word when a suffix is attached to it; exx. per+NYAta+an vs. per+nyaTA+an, 'declaration, expression'; BANtu+an vs. banTU+an, 'assistance' (stressed syllables are capitalized; + indicates a morpheme boundary).

The current research addresses the issue of stress and its position in Indonesian. In view of the divergent opinions in the literature on stress in Indonesian it seemed appropriate to perceptually test the intuitions of native speakers of Indonesian. The experiment reported in the present article is an acceptability test in which Indonesian listeners are asked to rate different stress patterns on a 7-point scale. If Indonesian words are judged more acceptable when the stress is assigned to the prefinal syllable we will conclude that the traditional rule holds good. If, on the other hand, acceptability is not significantly influenced by stress position, word stress must be free. The research should be seen as exploratory. Notwithstanding its limited scope, it is hoped that it will contribute to a better understanding of stress in Indonesian and in other speech communities where the status of stress may be problematic.

According to Samsuri (1978), any constituent of an Indonesian sentence can be put in focus, that is to say, presented by the speaker to the hearer as important, by providing it with a pitch accent. In languages

like Dutch and English such focused constituents receive a pitch accent on their prosodic head (Ladd 1980; Baart 1987).[1] In Indonesian, similar conspicuous pitch movements are attested, which (by default) are assumed to occur on the stressed syllable (van Zanten 1994:162; Ebing 1997:69–71). To investigate stress in Indonesian, target words were placed in final position in a fixed carrier sentence where they are expected to receive such an accent-lending pitch movement on the stressed syllable.

In many languages, the timing of the pitch movements is important. To cause the perception of prominence, a pitch movement needs to be relatively steep, and, at least in European languages, it has to occur in a specific position within the stressed syllable. In Dutch, an accent-lending (steep) rise has to start at the beginning of the stressed syllable, whereas an accent-lending (steep) fall has to be late in the syllable. If a steep rise occurs late in the syllable, or a fall early, it does not signal prominence, but rather a break in the linguistic structure ('t Hart, Collier and Cohen 1990:73). The exact timing of the rise seems more crucial than the timing of the fall (Caspers and van Heuven 1993a). The aim of the present experiment is to test the importance of shape and timing of accent-lending pitch movements in Indonesian. To this end Indonesian listeners were presented with sentences in which position and shape of the pitch movement are electronically manipulated.

According to van Heuven (1994:19), the size of the pitch movement correlates with the perceived strength of the accent: the larger the excursion size, the stronger the accent. Van Heuven (1994:18–19) mentions a threshold excursion size for accent-lending rises of around 3 semitones (ST) for an average Dutch speaker. For Indonesian, Odé (1994:48) mentions a smallest excursion size of 3 ST for audible and/or acoustically measurable pitch movements in her spontaneous speech data. Ebing (1994) analysed Indonesian phrase final pitch configurations taken from quasi-spontaneous speech. His 'Rise-Fall-Low' cluster comprises rises of two to four ST (Ebing 1994:200–207). In previous – informal – observations we found rises of approximately 2.5 ST. A weak pitch accent fits in nicely with the traditional description of weakly marked Indonesian stress (cf. for instance Teeuw, 1978:9) and with our finding that the difference in duration between stressed and unstressed syllables is comparatively small in Indonesian (van Zanten and van Heuven 1997). We decided to present the listeners with a set of stimulus sentences with a 2.5 ST pitch rise. To meet the possibility that the accent might be too weak, an otherwise identical set of stimuli with a 4 ST rise was also presented to the listeners.

In the research reported in the following section, we aim to experimentally verify the rule which attributes stress to the penultimate syllable in Indonesian. If words with stressed prefinal syllables are preferred we will conclude that stress is fixed on the prefinal syllable in Indonesian. If, on the other hand, words spoken with different stress patterns are equally acceptable to Indonesian listeners, we will conclude that stress is free in Indonesian. Thirdly, stress position may depend on morphological or phonological structure. If this is the case, we expect acceptability to be related to stimulus word type.

2 METHOD

2.1 Stimuli

To investigate stress placement in Indonesian, resynthesized speech was used, in which the fundamental frequency, which is the stronger correlate of accent, was manipulated. Three target words of different phonological and morphological composition were selected, viz. *anaknya* [anakɲa], 'his child' (V-CVC-CV) and *bantuan* [bantuan], 'help' (CVC-CV-VC), and, to test the stressability of schwa, *sebelum* [səbəlum], 'be-

[1]The situation may be different in Polish, where not the primary but the secondary stressed syllable is accented when a word is in focus (Dogil 1999). It is, however, also claimed that the secondary stress is gradually becoming primary stress in Polish (and the primary stress secondary; Wierzchowska 1971:219–221, cited by Dogil 1999). If this is so, the accent would be on the primary stressed syllable in Polish also.

fore' (CV-CV-CVC). The first two words consist of a base plus suffix (*anak+nya, bantu+an*) and the third of a prefix plus base (*se+belum*).

The three target words were embedded in the carrier sentence *Dia mengucapkan kata* (*anaknya*), 'He pronounces the word (*anaknya*)'. Target words are in sentence final position and expected to be in focus and to receive an accent-lending pitch movement on the stressed syllable. The three target words in their carrier sentences were each read twice by an Indonesian speaker of Balinese descent and recorded on DAT with a Sennheiser MKH 416 unidirectional condenser microphone. An example is presented in Figure 1.

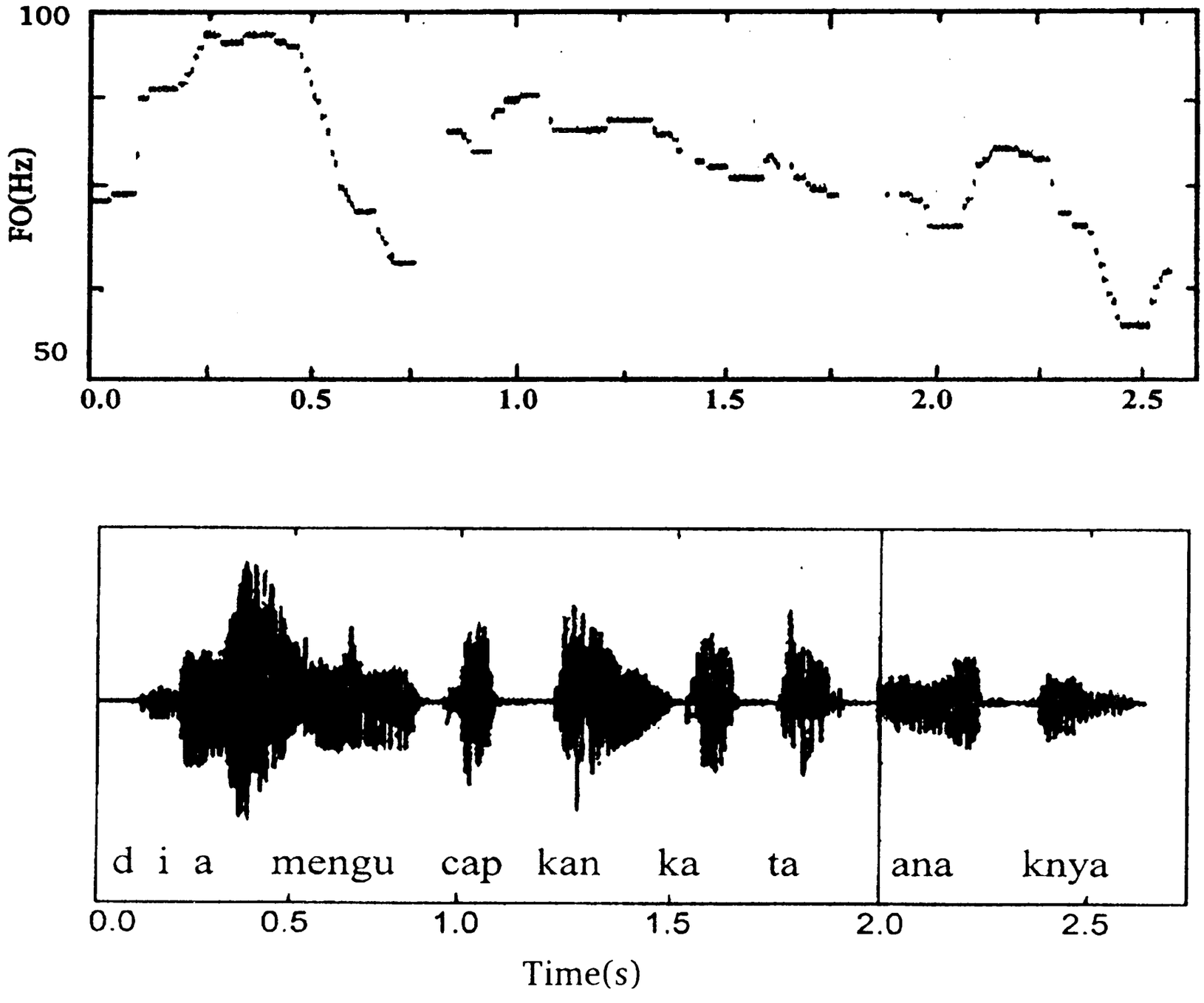

Fig. 1. Fundamental pitch (top panel) and acoustic signal (bottom panel) of the sentence Dia mengucapkan kata anaknya 'He pronounces the word his-child' spoken by an Indonesian speaker. The fundamental pitch (F0) is plotted on a logarithmic scale. The vertical line indicates the onset of the target word anaknya; this point was chosen as the alignment point (Position 0) for our artificial rise-fall movements.

The six resulting utterances were transferred to a Silicon Graphics workstation and downsampled to 16 kHz; pitch was extracted by subharmonic summation (Hermes 1988). The material was stylized and resynthesized ('t Hart, Collier and Cohen 1990), after which the relevant pitch movements were estimated and the segmental durations of the six target words measured. All sentences were spoken with the same intonation pattern, i.e. a rise-and-fall movement on the first word *Dia*, after which the pitch continued at a mid level declining gradually; target words had a pitch accent as expected. The pattern resembles Samsuri's basic intonation pattern (Samsuri 1978) and Halim's intonation pattern IP_1 (Halim 1974:134). For an extensive comparison of Samsuri's and Halim's views on Indonesian intonation see Ebing (1994:184-192) and Ebing (1997:27–36).

The utterances in which the three target words were closest in duration (*anaknya*: 594 ms; *bantuan*: 657 ms; *sebelum*: 672 ms)[2] were selected for the perception test. In these three utterances the pitch declination after *Dia* until the end of the utterance was replaced by the mean (mid level) declination of the six original utterances: a downtrend of 2 semitones (ST) per second. On these declinations the electronically manipulated accent-lending pitch movements were to be superimposed.

In previous – informal – measurements we found a great variety of (accent-lending) pitch movements and positions. Typically, these pitch movements in our material begin with either a gradual rise, or a steep rise followed by a high plateau. Rises usually start at the beginning of the first or second syllable of the sentence final word, but gradual rises may start earlier. The fall usually occurs on the prefinal and/or final syllables and may be fairly long.

We do not know which requirements in terms of timing and steepness of rise and fall have to be fullfilled in Indonesian in order to cause a perception of prominence on one syllable over another. We decided, then, to change position and shape of the pitch movement in small steps, regardless of the durational structure of the target words. The position of the rise was shifted in steps of 100 ms along the time axis and the high plateau was lengthened in steps of 50 ms. These values are based on Caspers (1994) and Caspers and van Heuven (1993b) who found that even highly experienced Dutch (distinctive stress) listeners need at least a 50 ms pitch rise shift to detect an audible difference.

Six evenly spaced positions (Positions 0-5) were chosen for the pitch movement. In the earliest position (Position 0, marked with a vertical line in Fig. 1), the end of the rise coincided with the beginning of the target word. In Position 1 the rise was shifted so that it ended 100 ms after the beginning of the word. In Position 2 the rise ended 200 ms after the beginning of the word, and so on, up to the last position (Position 5), where the rise ended 500 ms after the beginning of the target word.

Twelve different shapes were produced, as visualized in Figure 2. Most of these consisted of a steep rise (2.5 ST during 30 ms) which was either immediately followed by a fall or followed by a high declination line which was in turn followed by a fall. The fall always ended 2.5 ST below the mean (mid level) declination line. In all instances but three (viz. the steep falls 1k and 2k and the late fall 5m) the fall ended 575 ms after the beginning of the target word.

The shape of the pitch movement (while maintaining the steep 2.5 ST rise) was varied by lengthening the high declination line by 50 ms for each different version. This resulted in seven different shapes (Shapes a - g; Fig. 2: top panel), with high declination line durations of 0, 50, 100, 150, 200, 250 and 300 ms respectively. The end of the fall was fixed at 575 ms after the beginning of the target with a minimum fall duration of 75 ms. Because of the minimum fall duration it was not possible to implement all seven shapes on all six positions: the later the pitch movement position, the less shapes could be fitted in. Also, in Position 0, where steep rises were rare in our production data, only four versions were created (Versions 0a, 0c, 0e and 0g). Altogether twenty seven steep (30 ms) rise versions were created.

To these steep rise versions we added two rises of 250 ms and 500 ms, resp., which were immediately followed by a fall (Shapes i and j; Fig. 2: middle panel). They were implemented in all positions except Position 0 and amounted to 2 x 5 = 10 versions. Like the steep rise versions, they were motivated by informal measurements in previously recorded material, where we found long rises starting before the beginning of the target word. For the same reason, two versions (1k and 2k; Fig. 2: middle panel) were created in which a steep rise was immediately followed by a steep fall of 150 ms duration. Further, to match one of the attested pronunciations of *sebelum*, one version was created which consisted of a long (500 ms) rise, followed by a high declination line of 100 ms and a 75 ms fall (4n; Fig. 2: bottom panel). Finally, one

[2]Perceptually, the durations may be even closer, as the word final nasals of *bantuan* and *sebelum* (each around 100 ms) are relatively weak.

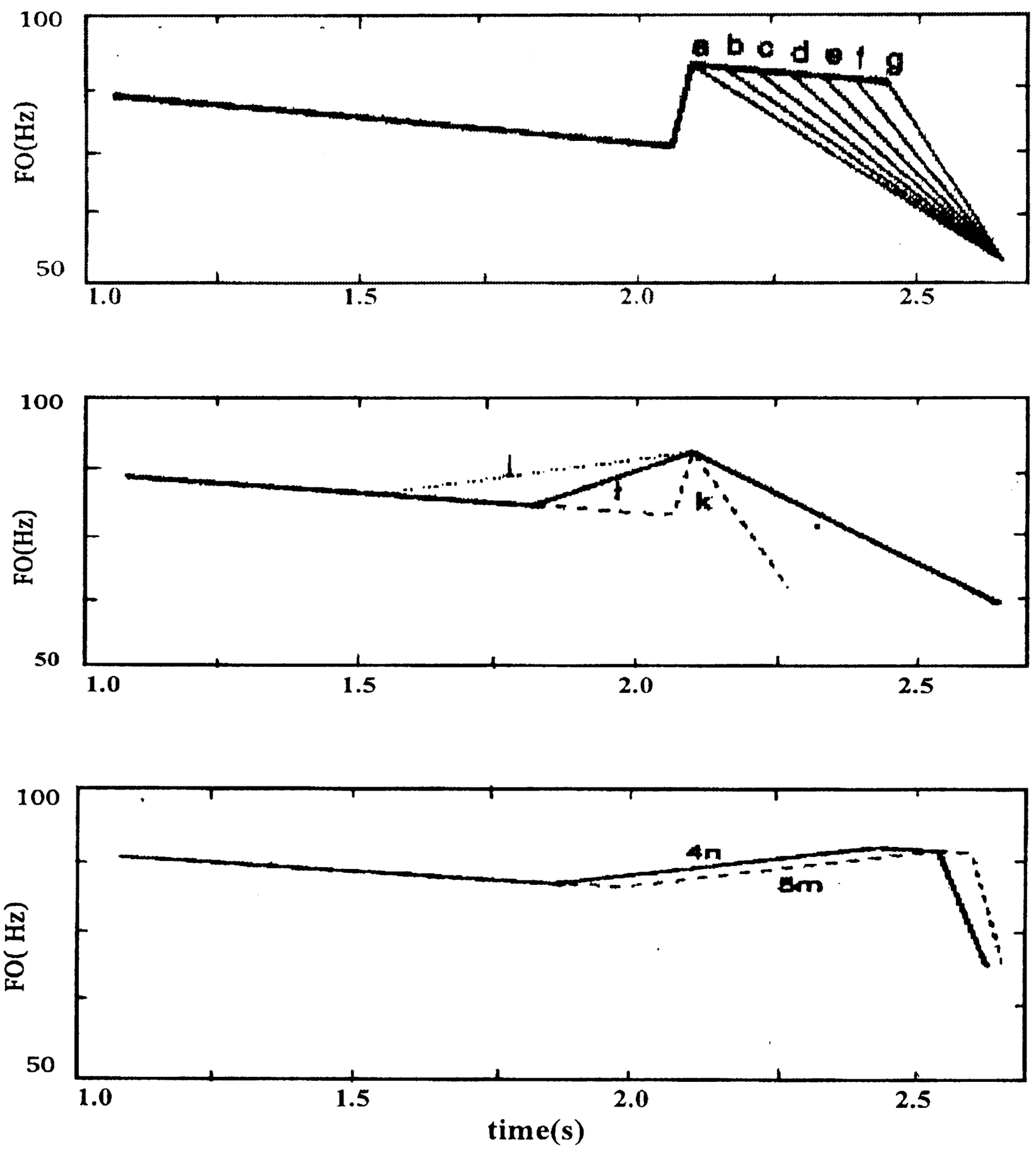

Fig. 2. The 12 different 2.5 ST pitch contour shapes. Top panel: Shapes a - g at Position 1 (end of rise 100 ms after the beginning of the target word). Middle panel: Shapes i, j and k at Position 1. Bottom panel: Shape n at Position 4 and Shape m at Position 5. The fundamental pitch (F0) is plotted on a logarithmic scale. Time is plotted as in Fig. 1.

Unattested version was added with a very short (50 ms) fall extremely late in the target word (5m; Fig. 2: bottom panel). We expected this version to score low in the acceptability test. Altogether 41 (2.5 ST) versions were created. Durational specifications of these 41 versions are presented in Appendix 1. Superimposed on the three selected target words (in their carrier sentences) this resulted in 123 different stimuli.

A pitch rise of 2.5 ST relates to a weak accent. To meet the possibility that the accent might be too weak for the listeners, we decided to add an otherwise identical set of stimuli with a pitch rise of 4 ST and a fall ending 4 ST below the mean declination line. The two sets of stimuli were recorded on audio tape in

the same random order with 2.5s intervals between the stimulus sentences. After the second set, the first set of stimuli was recorded once more. Each set was preceded by three practice items.

2.2 Listeners

Eight listeners took part in the experiment. All listeners were Indonesian students or post-graduates who had arrived in Leiden from Indonesia quite recently.

2.3 Procedure

The tape was played to each listener individually on a DAT recorder over good quality earphones. The set of stimuli with the 2.5 ST rise was presented first. It was followed by the set of stimuli with the larger 4 ST rise. Listeners were told that the sentences all had different intonations (*lagu kalimat*). They were not informed about the actual purpose of the experiments, i.e. to compare the acceptability of different stress patterns. Both times the listeners were asked to rate the acceptability of each utterance on a seven point scale. To this end the listeners were provided with a list of all stimulus sentences with for each sentence a seven point scale, ranging from 1 ('very bad') to 7 ('very good'). Subjects were requested to encircle the appropriate mark for each stimulus sentence. In the third and final part of the experiment, the set of stimuli with the smaller pitch excursion was presented again, but this time the listeners were asked to indicate on which syllable of the target word they perceived the stress. Each part of the test was preceded by three practice items with the appropriate pitch excursion. After the practice items the tape was always stopped to clarify any questions raised by the listeners. All instructions were in Indonesian.

3 RESULTS AND DISCUSSION

3.1 Acceptability

In the acceptability tests listeners were asked to rate the acceptability of each stimulus sentence on a 7-point scale. We were interested to know whether any particular shapes or positions of pitch movements would be more acceptable to our listeners than others. With very few exceptions, all stimuli were acceptable to all listeners: ratings below the mid rating 4 were exceptional (cf. Appendices 2a and 2b). The highest ratings 6 and 7, on the other hand, were frequently attributed. Most listeners differentiated very little, or not at all, between the various stimuli.

Table I presents the lowest and highest ratings averaged over eight listeners and the overall mean ratings for the three targets with 2.5 ST (left-hand side) and 4 ST (right-hand side) pitch contours. Table I reveals that mean ratings differ little: from 5.1 to 6.5 on our 7-point scale. On average, the 2.5 ST rise stimuli scored slightly higher than the larger 4 ST stimuli.[3] This can be seen as an indication that the listeners preferred the weaker stress (which we had also attested in the production data) to the stronger 4 ST stress stimuli. This fits in well with the traditional description of weakly marked stress in Indonesian. We decided to restrict further analysis to the set of stimuli with the smaller pitch excursion.

[3]A sign-test revealed no significant effect of excursion size, however ($z = 1.5$).

Table I. Lowest and highest mean ratings and overall means for the three targets, averaged over all listeners ('1': 'very bad'; '7': 'very good'). Left-hand side: 2.5 ST pitch rise stimuli; right hand side: 4 ST pitch rise stimuli.

	2.5 ST rise			4 ST rise		
	mean ratings			mean ratings		
	lowest	highest	overall	lowest	highest	overall
anaknya	5.4	6.5	5.9	5.3	6.4	5.8
bantuan	5.1	6.4	5.7	5.1	6.0	5.6
sebelum	5.5	6.4	6.1	5.5	6.5	6.0

An overview of the acceptability ratings for all 2.5 ST stimuli, averaged over all listeners is presented in Table II. Table II shows a tendency for stimuli with the end of the rise in the middle of the target word

Table II. Mean acceptability ratings; 2.5 ST pitch movements; 8 Indonesian listeners. Ratings of versions which closely resemble the six original tokens are underlined.

Shapes a-j: duration of the fall ranges from 575 to 75 ms, depending on position and duration of rise and high declination (see also Figure 2).
an: *anaknya* stimuli; ba: *bantuan* stimuli; se: *sebelum* stimuli

shape	position of end of rise																		shape of F0-movement (ms)		
	0			1			2			3			4			5					
	at target onset			100ms after target onset			200 ms after target onset			300 ms after target onset			400 ms after target onset			500 ms after target onset					
	an	*ba*	*se*	*an*	*ba*	*se*	*an*	*ba*	*se*	*an*	*ba*	*se*	*an*	*ba*	*se*	*an*	*ba*	*se*	rise	high	fall
A	5.5	5.8	6.1	5.9	5.6	6.3	6.1	6.0	6.1	6.0	5.9	6.1	5.9	6.0	6.1	5.8	5.6	6.0	30	0	
b				6.3	5.5	6.3	6.3	6.1	6.3	6.3	5.8	6.1	6.0	5.6	6.0				30	50	
c	6.0	5.1	6.0	6.1	6.4	6.3	6.5	5.4	6.3	5.9	6.0	6.0	5.9	5.9	5.9				30	100	
d				6.0	5.8	6.1	6.1	6.3	5.8	6.3	5.8	6.0							30	150	
e	5.8	5.4	6.1	5.8	5.8	5.9	5.5	5.3	6.0	6.1	5.9	6.3							30	200	
f				6.1	5.3	6.4	6.0	5.6	6.1										30	250	
g	5.9	6.0	6.1	5.6	5.3	6.0	5.9	5.6	5.9										30	300	
i				6.0	5.6	5.9	5.8	5.8	6.1	5.9	5.8	6.1	6.0	5.8	6.0	5.9	5.9	6.0	250	0	
j				5.8	5.3	5.8	6.1	6.3	6.1	5.9	6.3	5.9	5.6	5.6	5.8	5.4	5.4	6.0	500	0	
k				6.0	5.5	6.1	6.1	6.3	6.1										30	0	150
m																5.6	5.4	5.5	500	50	50
n													5.8	5.5	6.1				500	100	75
mean	5.8	5.6	6.1	6.0	5.6	6.1	6.0	5.9	6.1	6.1	5.9	6.1	5.9	5.7	6.0	5.7	5.6	5.9			

(Positions 2 and 3) to be judged slightly higher than stimuli with the end of the rise at the beginning or end of the target (Positions 0 and 5). Version 5m (characterized by a steep fall at the very end of the target

[6]Temporal organisation of the stimuli was not changed.

word), which did not occur in our production data, scored relatively low as expected, but was still acceptable to the listeners. Stimuli which resembled the original production of the target words closely (underlined in Table II), were not judged any more acceptable than the other stimuli.

To examine the significance of the effects of SHAPE and POSITION, as well as of TARGET word (*anaknya* vs. *bantuan* vs. *sebelum*) and LISTENER, we ran a MURALS analysis. MURALS is a computer program which is developed for multiple regression analysis of ordinal or nominal data (van der Kooij and Meulman 1996). The test revealed that for the 2.5 ST data the explained variance of the quantified variables R^2 = .79, which is, however, almost exclusively due to the variable LISTENERS (weight regression coefficient β = .89). When the variable LISTENERS is excluded from the analysis, R^2 drops to a mere .04, with the highest β value for the variable TARGET WORD (β = 174).

These results can be interpreted as follows. The explained difference in the acceptability ratings R^2 is caused nearly exclusively by individual listeners' judgments. Such differences are probably due to listeners' sensitivity to resynthesized speech and thus of no consequence for our research. There was a small effect of TARGET WORD, as can also be seen in Table I: *sebelum* stimuli were rated higher on average than *anaknya* and *bantuan* stimuli. This may be due to a better fit of the pitch movements to *sebelum*. The other variables (POSITION and SHAPE) had no significant effect on acceptability.

Our results indicate that speakers of Indonesian are fairly insensitive to shape and position of the accent-lending pitch movements. Ebing (1997:62-85) found small but significant differences in acceptability ratings between pitch movements in different positions in the word. Accented prefinal syllables seemed to be preferred, but all pitch movement positions were acceptable to the listeners. In our data we found a similar tendency, the mid positions scoring slightly higher than stimuli with pitch movements at the beginning or the end of the target word. We tentatively conclude that, at least in sentence-final position, any (small) rise-fall pitch movement is acceptable to Indonesian listeners. Acceptability is not significantly influenced by pitch movement position and no specific shape seems to be preferred: it seems that there are no restrictions on stress placement in Indonesian.

3.2 Stress perception

In the stress perception test listeners were requested to indicate for each (2.5 ST) stimulus on which syllable of the target word the stress was perceived. Results of the test are summarized in Table III; full results are presented in Appendix 3.

Table III. Overall stress perception ratings; 123 stimuli, 8 Indonesian listeners.

	stress perceived on							
	syllable 1		syllable 2		syllable 3		missing	
anaknya	53	(16%)	241	(73%)	32	(10%)	2	(1%)
bantuan	266	(81%)	17	(5%)	35	(11%)	10	(3%)
sebelum	137	(42%)	68	(21%)	120	(36%)	3	(1%)

Table III shows large differences between ratings for the three target words. Of the *anaknya* stimuli, 73% were perceived as having stress on the second syllable, whereas 81% of the *bantuan* stimuli were allotted stress on the first syllable. For the *sebelum* stimuli, the ratings are more evenly spread. These results can be partly explained by the durational structure of the target words concerned.[6] We do not know which of the pitch movements (rise or fall) might be prominence-lending. If we assume that steep rises are accent-lending this would mean that about 30 out of the 41 stimuli (viz. in Positions 1 - 3 and, possibly, 4) have an accent-lending pitch movement on the (approx. 300 ms) second syllable *-nak-* of *anaknya* (total

word duration 594 ms), thus explaining the 73% stress perceived on this second syllable. However, even when the rise-fall movement is completely in the final syllable (Version 5a; cf. App. 3), five out of the eight listeners indicate the stress on the second syllable of *anaknya*. The preference for stress on the second syllable of *anaknya* is according to the prevailing rules of Indonesian (stress on prefinal syllable), but may have been reinforced by the phonological structure of this syllable.

Similarly, *ban-* measures around 300 ms, almost half the duration of *bantuan* (650 ms). A large number of the pitch movements (Positions 0, 1, 2) falls on the first syllable of *bantuan* and might be considered to trigger the perception of stress on this first syllable. As the pitch movement moves further through the word (Positions 3, 4, 5), so do, partly, the responses. The majority of the responses, however, still favour the first syllable of *bantuan* as bearing the stress (cf. App. 3). The bias towards perceiving the stress on the first syllable of *bantuan* indicates a preference for this stress pattern for *bantuan*.

As regards *sebelum*, we expected a preference for stress on the prefinal syllable, or, if schwa is unstressable, on the final syllable. However, only one listener favoured the prefinal syllable nearly exclusively for all *sebelum* stimuli. It is rather the first and last syllables which are perceived as bearing the stress. Two listeners almost without exception perceived the stress on the first syllable of *sebelum* (cf. Appendix 3). This can be explained for the early rises (Position 0–2), but not for the stimuli where pitch movements occur later in the word. However, *sebelum* is a conjunction– as opposed to the content words *anaknya* and *bantuan*– and it is thinkable that our speaker brought out the first syllable of *sebelum* in this unusual (actually citational) position; cf. van Zanten (1994:162) and comparable observations in Ebing (1990), where Indonesian listeners perceived an accent on the first syllable of *terkejut* [tərkəjut]. On the whole, the picture for *sebelum* is less clear than for the other two targets. Choices seem, again, very much listener dependent. Whereas for *anaknya* and especially *bantuan* listeners tend to agree in their choice, there is less between-listener agreement on the stress pattern of *sebelum*. It seems likely that the stressability of schwa is listener dependent.

Stress perception was tied up very much with individual listeners but there was no systematic effect due to the regional language. Some listeners perceived the stress almost without exception on the second syllable of *anaknya*, or on the first syllable of *bantuan* or *sebelum*. No listeners perceived the stress on the same syllable for all three target words, which suggests that Indonesian words have different stress patterns which are related to their phonological and/or morphological shape. The stress preferences in both *anaknya* and *bantuan* can be explained by assuming that syllable structure plays a role in the Indonesian stress system. The preference for stress on the first syllable of *bantuan* can alternatively be seen as caused by the stress pattern of the base *bantu*; cf. De Hollander (1984:27); Alieva et al. (1991:64). At this stage it is impossible to tell whether this pattern should be seen as resulting from the stress on the penultimate syllable of the base word *bantu*, or by the fact that *ban* is a heavy syllable, or by a combination of these causes. To solve this problem the stress patterns of complex words the base of which does not contain a heavy syllable should be studied.

3.3 Acceptability and stress perception

In the Introduction we assumed that in Indonesian stress is fixed on the penultimate syllable if stimuli with stressed penultimate syllables are preferred. Therefore, we analysed the acceptability ratings for the target words with stress perceived on first, second and third syllable separately. Appendix 4 presents the listeners' acceptability ratings for stimuli with stress perceived on first, second or third syllable. We already stipulated in Section 3.1 that most listeners differentiated very little or not at all between the stimuli. When listeners did differentiate there was in the majority of cases no significant difference between the acceptability of stimuli with stress on first, second or third syllable, respectively. Analysis of variance

revealed significantly different ratings for only two listeners, viz. Listener 1, *anaknya* ($p<.02$) and *bantuan* ($p<.01$), and Listener 5, *anaknya* ($p<.02$); cf. Appendix 4.

In Table IV the mean acceptability ratings per target word and per syllable, averaged over all listeners are presented. Table IV shows that for all three targets, the mean ratings are highest when stress is perceived on the second syllable. We would like to think of this as a reflection of the prefinal syllable stress rule. However, analysis of variance revealed that statistical significance is only attained for the *anaknya* ratings ($p < .001$). This confirms our suggestion in the Introduction that stress on the prefinal syllable is preferred only when this syllable is heavy.

Table IV. Mean acceptability ratings per target word and per syllable, averaged over all listeners.

	stress perceived on		
target	syllable 1	syllable 2	syllable 3
anaknya	5.2	6.1	5.6
bantuan	5.8	5.9	5.3
sebelum	6.0	6.1	6.0
all targets	5.7	6.0	5.6

4 CONCLUSION

In the present study we tested acceptability and stress perception of Indonesian words of different phonological and morphological structure. We presented the listeners with a great variety of pitch movements as regards shapes and locations. All these stimuli were acceptable to the listeners. One listener actually remarked that he could hear that the stimuli were different, but that he, as an Indonesian, was used to different pronunciations, and that all stimuli were quite acceptable to him. Acceptability ratings ranged, for nearly all speakers and all stimuli, from mid (4) to very good (7). The lowest mean rating, viz. 5.2, was well above the mid rating on our 7-point scale. The results of the acceptability test indicate that, at least at the end of a sentence, accent-lending pitch movements are acceptable on any syllable in Indonesian.

The results of the stress perception experiment suggest different stress patterns for the three target words. For *anaknya*, stress on the prefinal syllable is the prevailing pattern. This is corroborated by the fact that *anaknya* stimuli which are perceived as having stress on the prefinal syllable scored significantly higher in the acceptability test than *anaknya* stimuli which are perceived as having stress on the initial or final syllables. Apparently, stress on the heavy prefinal syllable is preferred to stress on first or final syllables even if these latter pronunciations are considered acceptable by Indonesian listeners.

For *bantuan* stress is almost always perceived on the first syllable; for *sebelum* the first and the final syllable are favoured, but not the second syllable. We conclude that the traditional description of stress on the prefinal syllable does not give a full account of the actual speech situation. It would seem that the phonological composition of words plays a role in stress placement, and that CVC syllables tend to attract the stress regardless of their position in the word. Most importantly, however, all stimuli were acceptable to our listeners, regardless of position and shape of the pitch movement, thus suggesting that stress is free in Indonesian.

In van Zanten (1994:156–163) we analysed the durational structure of words spoken in and out of focus. The data suggested that, especially in longer words, the stress does not necessarily fall on the penul-

timate syllable: it was often the initial rather than the penultimate syllable which was lengthened, and in some tokens the second or third syllables were relatively long and provided with an accent-lending pitch movement. The variety in durational patterning gave us reason to hypothesize that Indonesian speakers have a large amount of freedom as far as stress allocation is concerned. This hypothesis now finds support in the tolerance of our listeners as regards shape and position of the accent-lending pitch movement.

Halim (1974:111–113) already held the view that there is no word stress in Indonesian. According to Halim, the position of the (phrasal) pitch accent is, however, restricted to prefinal and final syllables; the placement of accent on earlier syllables of polysyllabic words makes them sound artificial or foreign (Halim 1974:111, note 27). On the other hand, Halim suggested that the accent may be shifted to a prefix syllable to signal contrast (ex. *MEnanam* vs. *BERtanam*; Halim 1974:77–79). Recently, however, Ebing (1997:92–95) found evidence that stress serves no contrastive functions in Indonesian. Speakers were not able to signal the in focus versus out of focus character of (parts of) words, nor were listeners able to decode the (intended) focus structure. Differences in the location of pitch accents were apparently not related to differences in focus distribution. This can be seen as an indication that there is no preferred stress position in Indonesian. In the current research we found that pitch movements are acceptable on any syllable of the accented word in Indonesian. This confirms the suggestion we made in the Introduction that stress is indeed free in Indonesian, be it that prefinal syllables, especially when heavy, score a little higher as stress-bearers.[7]

If, in a language, stress is fixed on the penultimate syllable, this will help listeners to identify words. If, on the other hand, stress can occur in different positions in the same word, as seems to be the case in Indonesian, we may expect that it does not help listeners to identify words and thus is not relevant in speech communication. In a second perception experiment (van Zanten and van Heuven 1998), we address the question of stress in Indonesian from a speech communication point of view.

ACKNOWLEDGEMENTS

The research for this article would not have been possible without the kind cooperation of our Indonesian informants, especially I.B.M. Palguna. The authors also wish to acknowledge the assistance of Jos Pacilly and Wim van Zanten for technical and statistical support, respectively.

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[7]Further evidence for free stress in Indonesian is provided by van Zanten, Goedemans and Pacilly (2003).

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APPENDIX 1: DURATIONAL SPECIFICATIONS OF THE STIMULI RELATIVE TO THE ONSET OF THE TARGET WORD

Position	Shape	beginning of rise	end of rise	beginning of fall	end of fall
		relative to target onset (ms)			
0	a	-30	0	0	575
0	c	-30	0	100	575
0	e	-30	0	200	575
0	g	-30	0	300	575
1	a	70	100	100	575
1	b	70	100	150	575
1	c	70	100	200	575
1	d	70	100	250	575
1	e	70	100	300	575
1	f	70	100	350	575
1	g	70	100	400	575
1	i	-150	100	100	575
1	j	-400	100	100	575
1	k	70	100	100	250
2	a	170	200	200	575
2	b	170	200	250	575
2	c	170	200	300	575
2	d	170	200	350	575
2	e	170	200	400	575
2	f	170	200	450	575
2	g	170	200	500	575
2	i	-50	200	200	575
2	j	-300	200	200	575
2	k	170	200	200	350
3	a	270	300	300	575
3	b	270	300	350	575
3	c	270	300	400	575
3	d	270	300	450	575
3	e	270	300	500	575
3	i	50	300	300	575
3	j	-200	300	300	575
4	a	370	400	400	575
4	b	370	400	450	575
4	c	370	400	500	575
4	i	150	400	400	575
4	j	-100	400	400	575
4	n	-100	400	500	575
5	a	470	500	500	575
5	i	250	500	500	575
5	j	0	500	500	575
5	m	0	500	550	600

APPENDIX 2A: ACCEPTABILITY RATINGS 2.5 ST STIMULI

		anaknya									***bantuan***									***sebelum***								
		listener nr.									listener nr.									listener nr.								
pos.	shape	1	2	3	4	5	6	7	8	mean	1	2	3	4	5	6	7	8	mean	1	2	3	4	5	6	7	8	mean
0	a	6	7	4	6	5	6	3	7	5.5	5	7	4	5	7	6	5	7	5.8	6	7	4	7	7	7	4	7	6.1
0	c	6	7	4	7	6	6	5	7	6.0	6	7	4	6	5	5	2	6	5.1	6	7	4	7	6	5	6	7	6.0
0	e	6	7	4	6	7	6	3	7	5.8	7	7	4	6	6	5	1	7	5.4	6	7	4	7	6	6	6	7	6.1
0	g	6	7	4	6	7	6	4	7	5.9	6	7	4	7	5	7	5	7	6.0	6	7	4	6	7	6	6	7	6.1
1	a	6	7	4	6	7	6	4	7	5.9	6	7	4	7	7	6	1	7	5.6	6	7	4	6	6	7	7	7	6.3
1	b	6	7	4	7	6	6	7	7	6.3	6	7	4	6	6	6	2	7	5.5	6	7	4	7	6	6	7	7	6.3
1	c	6	7	4	7	6	5	7	7	6.1	6	7	4	7	6	7	7	7	6.4	6	7	4	7	5	7	7	7	6.3
1	d	6	7	4	6	7	5	6	7	6.0	6	7	4	6	6	5	5	7	5.8	7	7	4	5	6	6	7	7	6.1
1	e	6	7	4	6	6	6	4	7	5.8	6	7	4	7	6	5	4	7	5.8	6	7	4	6	5	6	6	7	5.9
1	f	6	7	4	7	6	6	6	7	6.1	6	7	4	6	6	5	1	7	5.3	7	7	4	6	6	7	7	7	6.4
1	g	6	7	4	6	6	5	4	7	5.6	6	7	4	6	7	5	1	6	5.3	6	7	4	7	6	6	5	7	6.0
1	i	6	7	4	6	6	6	6	7	6.0	7	7	4	6	7	6	1	7	5.6	6	7	4	7	5	5	6	7	5.9
1	j	6	7	4	6	7	5	4	7	5.8	6	7	4	6	7	5	1	6	5.3	6	7	4	6	6	6	4	7	5.8
1	k	6	7	3	6	7	7	5	7	6.0	6	7	4	6	6	6	2	7	5.5	6	7	4	7	7	7	4	7	6.1
2	a	7	7	3	6	7	7	5	7	6.1	6	7	4	6	7	6	6	6	6.0	6	7	4	7	5	7	6	7	6.1
2	b	6	7	4	7	7	6	6	7	6.3	6	7	4	6	6	6	7	7	6.1	6	7	4	7	6	6	7	7	6.3
2	c	7	7	4	7	7	6	7	7	6.5	6	7	4	6	6	5	2	7	5.4	6	7	4	7	6	7	6	7	6.3
2	d	6	7	4	7	6	6	6	7	6.1	6	7	4	7	6	7	6	7	6.3	6	7	4	6	6	6	4	7	5.8
2	e	6	7	4	6	6	5	3	7	5.5	5	7	4	6	6	5	2	7	5.3	6	7	4	6	6	6	6	7	6.0
2	f	6	7	4	6	7	5	6	7	6.0	6	7	4	7	5	5	5	6	5.6	6	7	4	7	6	6	6	7	6.1
2	g	6	7	4	6	5	5	7	7	5.9	5	7	4	6	5	7	4	7	5.6	6	7	4	7	6	5	5	7	5.9
2	i	6	7	4	6	7	5	4	7	5.8	6	7	4	6	6	6	4	7	5.8	6	7	4	7	6	6	6	7	6.1
2	j	6	7	4	6	7	5	7	7	6.1	6	7	4	6	7	7	6	7	6.3	6	7	4	7	7	6	5	7	6.1
2	k	6	7	4	6	7	6	6	7	6.1	6	7	4	7	7	7	6	6	6.3	6	7	4	6	5	7	7	7	6.1
3	a	6	7	4	6	6	6	6	7	6.0	5	7	4	6	5	7	6	7	5.9	6	7	4	6	7	6	6	7	6.1
3	b	7	7	3	6	7	7	6	7	6.3	6	7	4	6	7	5	4	7	5.8	6	7	4	7	6	6	6	7	6.1
3	c	5	7	4	6	6	6	6	7	5.9	6	7	4	6	6	6	6	7	6.0	6	7	4	6	6	6	6	7	6.0
3	d	6	7	4	7	6	6	7	7	6.3	6	7	4	6	6	6	4	7	5.8	6	7	4	7	6	6	5	7	6.0
3	e	6	7	4	6	5	7	7	7	6.1	7	7	4	6	6	6	4	7	5.9	6	7	4	7	7	6	6	7	6.3
3	i	6	7	4	6	5	6	6	7	5.9	6	7	4	7	6	5	4	7	5.8	6	7	4	6	5	7	7	7	6.1
3	j	6	7	4	6	7	6	4	7	5.9	6	7	4	7	6	7	6	7	6.3	6	7	4	6	6	5	6	7	5.9
4	a	6	7	4	6	6	7	4	7	5.9	6	7	4	7	7	6	4	7	6.0	6	7	4	7	6	6	6	7	6.1
4	b	6	7	4	6	7	5	6	7	6.0	6	7	4	6	6	7	2	7	5.6	6	7	4	6	5	6	7	7	6.0
4	c	5	7	4	6	6	6	6	7	5.9	5	7	4	7	5	7	6	6	5.9	6	7	4	7	6	6	4	7	5.9
4	i	6	7	4	6	6	6	6	7	6.0	6	7	4	7	7	6	3	6	5.8	6	7	4	6	6	7	5	7	6.0
4	j	6	7	4	6	5	6	4	7	5.6	6	7	4	7	5	6	3	7	5.6	6	7	4	7	6	6	3	7	5.8
4	n	5	7	4	6	5	6	6	7	5.8	6	7	4	7	6	5	3	6	5.5	6	7	4	7	6	6	6	7	6.1
5	a	5	7	4	6	6	6	5	7	5.8	5	7	4	4	6	6	6	7	5.6	6	7	4	7	6	5	6	7	6.0
5	i	5	7	4	6	6	6	6	7	5.9	5	7	4	6	6	7	6	6	5.9	6	7	4	6	6	6	6	7	6.0
5	j	5	7	4	6	6	4	4	7	5.4	6	7	4	7	5	5	2	7	5.4	6	7	4	7	5	6	6	7	6.0
5	m	5	7	4	6	5	5	6	7	5.6	5	7	4	6	5	5	4	7	5.4	5	7	4	6	4	5	6	7	5.5

APPENDIX 2B: ACCEPTABILITY RATINGS 4 ST STIMULI

		anaknya									***bantuan***									***sebelum***								
		listener nr.									listener nr.									listener nr.								
pos.	shape	1	2	3	4	5	6	7	8	mean	1	2	3	4	5	6	7	8	mean	1	2	3	4	5	6	7	8	mean
0	a	6	7	4	5	7	7	3	7	5.8	6	7	5	5	6	6	2	7	5.5	6	7	5	6	7	7	7	7	6.5
0	c	6	7	4	6	7	6	2	7	5.6	4	7	5	6	6	6	3	7	5.5	6	7	5	6	6	6	5	7	6.0
0	e	6	7	4	6	7	6	2	7	5.6	5	7	5	6	7	5	3	6	5.5	6	7	5	6	7	7	4	7	6.1
0	g	6	7	4	6	6	6	1	7	5.4	5	7	5	7	7	5	1	7	5.5	6	7	5	7	6	5	4	7	5.9
1	a	6	7	5	6	7	5	3	7	5.8	6	7	5	6	7	6	1	6	5.5	6	7	4	6	7	6	6	7	6.1
1	b	7	7	5	6	6	5	4	7	5.9	6	7	5	6	7	6	2	6	5.6	6	7	5	6	7	7	2	7	5.9
1	c	6	7	5	6	7	6	2	7	5.8	7	7	5	6	6	5	1	6	5.4	6	7	5	7	5	6	7	7	6.3
1	d	6	7	5	6	6	5	4	7	5.8	6	7	5	6	6	6	2	6	5.5	6	7	4	6	5	6	4	7	5.6
1	e	6	7	5	6	7	5	6	7	6.1	6	7	5	6	7	5	2	7	5.6	6	7	5	6	7	6	4	7	6.0
1	f	7	7	5	6	5	5	4	7	5.8	6	7	5	6	6	5	3	7	5.6	7	7	4	6	5	5	6	7	5.9
1	g	6	7	5	6	5	5	6	7	5.9	6	7	5	7	6	7	1	7	5.8	6	7	5	7	7	6	5	7	6.3
1	i	6	7	5	6	7	6	2	7	5.8	5	7	5	6	7	6	3	6	5.6	6	7	5	6	6	6	5	7	6.0
1	j	6	7	5	6	7	6	2	7	5.8	6	7	6	5	6	6	2	7	5.6	5	7	5	6	7	6	6	7	6.1
1	k	6	7	5	6	6	7	2	7	5.8	7	7	5	7	7	6	1	6	5.8	6	7	5	7	6	7	6	7	6.4
2	a	7	7	5	6	6	6	4	7	6.0	6	7	4	6	5	5	6	6	5.6	6	7	5	6	7	6	4	7	6.0
2	b	6	7	5	6	6	5	2	7	5.5	6	7	5	7	6	5	3	7	5.8	6	7	5	6	7	6	4	7	6.0
2	c	6	7	4	6	7	6	7	7	6.3	6	7	5	6	5	6	4	7	5.8	6	7	5	7	6	7	4	7	6.1
2	d	7	7	4	6	6	5	3	7	5.6	5	7	5	7	6	6	1	7	5.5	6	7	5	6	7	6	4	7	6.0
2	e	6	7	4	6	7	5	6	7	6.0	6	7	5	7	5	5	3	6	5.5	6	7	5	6	7	6	6	7	6.3
2	f	6	7	5	6	5	5	4	7	5.6	5	7	5	6	6	5	2	7	5.4	6	7	5	6	6	6	4	7	5.9
2	g	5	7	5	6	4	5	3	7	5.3	5	7	4	7	4	5	2	7	5.1	6	7	5	7	6	5	5	7	6.0
2	i	6	7	5	6	7	6	3	7	5.9	6	7	5	7	7	5	1	7	5.6	6	7	5	6	6	7	6	7	6.3
2	j	6	7	5	6	7	6	5	7	6.1	7	7	5	6	6	5	1	6	5.4	5	7	5	7	6	6	4	7	5.9
2	k	6	7	5	6	7	7	6	7	6.4	6	7	5	7	7	6	4	6	6.0	6	7	5	6	5	6	7	7	6.1
3	a	6	7	5	6	7	7	6	7	6.4	6	7	5	6	6	6	4	7	5.9	6	7	5	6	5	5	4	7	5.6
3	b	6	7	5	6	6	6	6	7	6.1	6	7	5	7	6	6	4	7	6.0	6	7	5	7	7	6	4	7	6.1
3	c	6	7	5	6	6	6	4	7	5.9	5	7	5	6	6	7	1	7	5.5	6	7	5	6	6	5	6	7	6.0
3	d	5	7	5	6	6	6	2	7	5.5	5	7	5	6	5	6	6	7	5.9	5	7	5	6	6	5	4	7	5.6
3	e	5	7	4	5	6	6	6	7	5.8	5	7	4	6	5	5	5	7	5.5	5	7	5	7	5	5	4	7	5.6
3	i	6	7	5	6	7	6	6	7	6.3	6	7	5	6	6	6	2	6	5.5	6	7	5	7	5	7	7	7	6.4
3	j	6	7	5	6	7	5	3	7	5.8	6	7	5	7	6	6	2	7	5.8	6	7	5	6	6	7	6	7	6.3
4	a	6	7	5	6	6	7	4	7	6.0	5	7	4	6	6	5	4	6	5.4	5	7	5	6	6	6	6	7	6.0
4	b	5	7	5	6	5	7	4	7	5.8	6	7	4	6	5	6	3	7	5.5	6	7	5	6	6	6	6	7	6.1
4	c	5	7	4	6	5	7	4	7	5.6	5	7	5	6	6	5	4	7	5.6	6	7	5	6	4	5	6	7	5.8
4	i	6	7	5	6	7	5	3	7	5.8	6	7	5	7	5	6	4	6	5.8	6	7	5	6	6	6	6	7	6.1
4	j	6	7	4	6	6	6	6	7	6.0	6	7	4	7	6	6	3	6	5.6	6	7	4	6	7	5	4	7	5.8
4	n	5	7	4	6	4	6	6	7	5.6	5	7	5	6	5	5	2	7	5.3	6	7	5	6	6	7	6	7	6.3
5	a	5	7	5	6	6	7	7	7	6.3	7	6	4	6	4	6	4	7	5.5	6	7	5	6	6	5	6	7	6.0
5	i	5	7	5	5	5	6	4	7	5.5	6	7	4	6	4	5	6	7	5.6	6	7	5	6	5	5	6	7	5.9
5	j	5	7	4	6	5	5	6	7	5.6	5	7	5	7	5	5	3	7	5.5	6	7	5	7	5	6	4	7	5.9
5	m	5	7	5	6	5	5	4	7	5.5	5	7	4	7	5	5	6	7	5.8	5	7	5	6	5	5	4	7	5.5

APPENDIX 3: STRESS PERCEPTION IN THREE TARGET WORDS OF DIFFERENT MORPHOLOGICAL AND PHONOLOGICAL STRUCTURE

			anaknya												***bantuan***												***sebelum***											
			listener nr.												listener nr.												listener nr.											
posshp		1	2	3	4	5	6	7	8	all	listeners				1	2	3	4	5	6	7	8	all	listeners				1	2	3	4	5	6	7	8	all	listeners	
		stress perceived on								s1	s2	s3	inv		stress perceived on								s1	s2	s3	inv		stress perceived on								s1	s2	s3	inv
0	a	2	1	2	2	2	2	2	2	1	7	0	0		1	1	1	1	1		1	1	7	0	0	1		2	3	1	1	1	3	3	3	3	1	4	0
0	c	2	1	1	2	2	2	1	2	3	5	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	1	3	1	1	3	3	3	3	1	4	0
0	e	2	1	2	2	2	2	1	2	2	6	0	0		2	1	1	1	1	1	1	1	7	1	0	0		2	2	2	1	1	2	1	3	3	4	1	0
0	g	2	2		2	2	2	2	2	0	7	0	1		1	1	1	1	1	1	1	1	8	0	0	0		2	2	3	1	1	1	1	3	4	2	2	0
										6	25	0	1										30	1	0	1										13	8	11	0
1	a	2	2	1	2	2	2	2	2	1	7	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	1	3	1	1	3	3	3	3	1	4	0
1	b	2	2	1	2	2	2	1	2	2	6	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	1	3	1	1	3	3	3	3	1	4	0
1	c	2	2	1	1	2	2	2	2	2	6	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	3	3	1	1	2	1	3	3	2	3	0
1	d	2	2	1	2	2	2	2	2	1	7	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2		1	1	2	2	2	3	2	4	1	1
1	e	2	2	1	1	3	2	2	3	2	4	2	0		1	1	1	1	1	1	1	1	8	0	0	0		2	1	1	1	1	3	3	3	4	1	3	0
1	f	2	2	1	1	2	2	2	2	2	6	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	3	3	1	1	2	1	3	3	2	3	0
1	g	2	2	1	2	2	2	2	2	1	7	0	0		1	1	1	1	1		1	1	7	0	0	1		2	1	1	1	1	3	3	3	4	1	3	0
1	i	1	2	1	2	2	2	1	2	3	5	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	1	3	1	1	3	3	3	3	1	4	0
1	j	2	2	1	1	2	2	1	2	3	5	0	0		1	1	3	1	1	1	1	1	7	0	1	0		2	3	1	1	1	1	1	3	5	1	2	0
1	k	2	2	1	1	2	2	2	2	2	6	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	2	1	1	1	3	3	3	3	2	3	0
										19	59	2	0										78	0	1	1										33	16	30	1
2	a	2	2	1	1	2	2	2	2	2	6	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	2	1	1	1	1	3	3	4	2	2	0
2	b	2	2	1	1	2	2	2	2	2	6	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	1		1	1	3	3	1	4	1	2	1
2	c	2	2	1	2	2	2	2	2	1	7	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	2	1	1	1	3	3	3	3	2	3	0
2	d	2	2	1	2	2	2	2	2	1	7	0	0		2	1	1	1	1	1	1	1	7	1	0	0		2	1	1	1	1	1	3	3	5	1	2	0
2	e	2	2	1	2	2	2	2	2	1	7	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	2	1	1	1	1	1	3	5	2	1	0
2	f	2	2	2	2	2	2	2	2	0	8	0	0		1	1	3	1	1	1	1	1	7	0	1	0		2	1	2	1	1	3	1	3	4	2	2	0
2	g	2		3	2	3	2	2	2	0	5	2	1		1	1		1	1	1	1	1	7	0	0	1		2	2	3	1	1	2	3	3	2	3	3	0
2	i	2	2	2	1	1	2	2	2	2	6	0	0		1	2	1	1	1	1	1	1	7	1	0	0		2	1	1	1	1	1	1	3	6	1	1	0
2	j	2	2	2	2	2	2	2	2	0	8	0	0		1	1	1	1	1	1	1	1	8	0	0	0		1	1	3	1	1	2	1	3	5	1	2	0
2	k	2	2	3	2	2	2	2	2	0	7	1	0		1	1	1	1	1	1	1	1	8	0	0	0		2	1	3	1	1	3	1	3	4	1	3	0
										9	67	3	1										76	2	1	1										42	16	21	1
3	a	2	2	1	2	2	2	1	2	2	6	0	0		1	1	1	1	1	1	1	1	8	0	0	0		2	3		1	1	2	1	2	3	3	1	1
3	b	2	2	1	1	2	2	2	2	2	6	0	0		2	2	3	1	1	1	2	1	4	3	1	0		2	1	1	1	1	1	3	3	5	1	2	0
3	c	2	2	2	1	2	2	2	2	1	7	0	0		2	2	1	1	1		1	1	5	2	0	1		2	2	1	1	1	3	3	3	3	2	3	0
3	d	3	3	1	1	3	2	2	2	2	3	3	0		2	3	3	1	1		1	1	4	1	2	1		2	3	3	1	1	2	2	3	2	3	3	0
3	c	2	3	3	2	3	2	3	2	0	4	4	0		1	3	3	1	3		1	1	4	0	3	1		2	3	3	1	1	3	3	3	2	1	5	0
3	i	2	1	1	1	2	2	2	2	3	5	0	0		1	1	1	1	1	2	1	1	7	1	0	0		2	2	1	1	1	1	1	3	5	2	1	0
3	j	2	2	2	2	2	2	2	2	0	8	0	0		2	1	1	1	1	1	1	1	7	1	0	0		2	2	1	1	1	2	1	3	4	3	1	0
										10	39	7	0										39	8	6	3										24	15	16	1
4	a	2	2	2	2	2	2	2	2	0	8	0	0		2	2	1	1	1		2	1	4	3	0	1		2	2	3	1	1	2	3	3	2	3	3	0
4	b	2	2	2	1	3	2	2	2	1	6	1	0		1	2	3	1	3	1	2	1	4	2	2	0		2	3	1	1	1	1	3	3	4	1	3	0
4	c	3	3	3	2	3	2	3	2	0	3	5	0		3	3	3	1	3		1	1	3	0	4	1		2	3	3	1	1	3	3	3	2	1	5	0
4	i	2	2	2	1	3	2	2	2	1	6	1	0		1	2	3	1	1		1	1	5	1	1	1		1	1	3	1	1	1	1	3	6	0	2	0
4	j	2	2	1	2	2	2	2	2	1	7	0	0		1	1	1	3	1	1	1	1	7	0	1	0		2	3	1	1	1	2	3	3	3	2	3	0
4	n	2	1	3	2	3	2	2	2	1	5	2	0		3	1	3	1	3	1	1	1	5	0	3	0		2	3	3	1	1	3	1	3	3	1	4	0
										4	35	9	0										28	6	11	3										20	8	20	0

		anaknya												***bantuan***												***sebelum***											
		listener nr.								all listeners				listener nr.								all listeners				listener nr.								all listeners			
posshp		1	2	3	4	5	6	7	8	s1	s2	s3	inv	1	2	3	4	5	6	7	8	s1	s2	s3	inv	1	2	3	4	5	6	7	8	s1	s2	s3	inv
		stress perceived on												stress perceived on												stress perceived on											
5	a	2	2	1	1	3	2	2	2	2	5	1	0	3	3	3	1	3	1	1	1	4	0	4	0	2	3	3	1	3	3	3	3	1	1	6	0
5	i	3	3	3	2	3	2	2	2	0	4	4	0	3	3	3	1	3	1	1	1	4	0	4	0	2	3	3	1	1	3	3	3	2	1	5	0
5	j	2	2	3	1	3	2	2	2	1	5	2	0	3	3	3	1	3		1	1	3	0	4	1	2	3	3	1	3	3	3	3	1	1	6	0
5	m	3	3	1	1	3	2	3	2	2	2	4	0	3	3	3	1	3	1	1	1	4	0	4	0	2	3	3	1	2	3	3	3	1	2	5	0
										5	16	11	0									15	0	16	1									5	5	22	0
tot.	s1	1	5	23	17	1	0	6	0	53				28	28	27	40	33	31	38	41	266				2	14	17	41	37	10	15	1	137			
	s2	36	30	10	24	28	41	32	40	241				7	6	0	0	0	1	3	0	17				39	11	2	0	2	11	2	1	68			
	s3	4	5	7	0	12	0	3	1	32				6	7	13	1	8	0	0	0	35				0	15	20	0	2	20	24	39	12			
invalid		0	1	1	0	0	0	0	0	2				0	0	1	0	0	9	0	0	10				0	1	2	0	0	0	0	0	3			

APPENDIX 4: ACCEPTABILITY RATINGS OF 2.5 ST STIMULI (missing values not included)

	listener 1	listener 2	listener 3	listener 4	listener 5	listener 6	listener 7	listener 8	all listeners
acc. rating	stress on syll. No	stress on syll. no	stress on syll. no	stress on syll. no	Stress on syll. no	stress on syll. no	stress on syll. no	stress on syll. no	stress on syll. no
	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3	1 2 3
anaknya									
1									
2									
3							1 2		4 2 2
4			3			1	1 9		21 20 1
5	4 3		20 10 7		3 4	11	1 3		1
6	1 29 1			13 20	5 11 7	24	2 13 2		21 2
7	3	5 30 5		4 4	1 14 1	5	1 5 1	40 1	16 97 1
mean	6.00 5.97 5.23	7.00 7.00 7.00	3.87 4.00 4.00	6.24 6.17	7.00 6.39 5.75	5.80	5.17 5.31 6.33	7.00	11 101 2 5.17 6.14 5.59
significance	p<.02	-	-	-	p<.02	-	-	-	p<.001
bantuan									
1							6		6
2							6		
3							1		6
4			27	1			3		1
5	4		13	1	6	12 1	7		3
6	4			24	3	9	2	10	
7	22 6	28		14	16	10	4	31	35
mean	2	6 7		1	5	5.94 5.00	10	6.76	2 13
	2	7.00 7.00	4.00	6.28	11		2		27 1 7
	1	7.00	4.00	7.00	6.15		3.92 3.33		91
	5.93 6.14				5.63				6 7
	5.33								98 7 8
									5.77 5.88
									5.29
significance	p<.01	-	-	-	-	-	-	-	-
sebelum									

1 2 3 4 5 6 7 mean	1 2 36 1 2 6.00 6.03	14 11 15 7 00 7.00 7.00	17 2 20 4.00 4.00 4.00	1 16 24 6.56	1 7 1 24 1 1 6 5.97 5.00 5.50	2 4 7 11 3 2 5 6.30 6.00 6.05	1 1 1 4 2 1 2 8 13 4 1 4 6.00 6.00 5.63	1 1 39 7.00 7.00 7.00	1 18 3 24 10 4 7 57 44 25 52 17 63 6.04 6.10 6.04
significance	-	-	-	-	-	-	-	-	-