24-month-olds integrate word stress and intonation in word recognition
Paula Fikkerta & Aoju Chenb
Radboud University Nijmegen, Max Planck Institute for Psycholinguistics
p.fikkert@let.ru.nl, aoju.chen@mpi.nl

The ability to recognise words in continuous speech is fundamental to language acquisition. In many languages, words have lexical stress. Past work has shown that English-learning infants can use information on word stress to recognise words from early on [1,2]. However, in everyday speech there is substantial variation in word production even within a speaker. A main source of variation is that speakers can realize a word in different intonation for different communicational purposes. Very recent work suggests that young children can recognise words independent of changes in pitch level and shape by 2.5 years [3,4]. To date, no research has been done to examine the interface between word stress and intonation in young children's word recognition. [3] used monosyllabic words; [4] used tokens of a disyllabic word with the same stress pattern. Considering that word stress and intonation have the same acoustic correlates, variation in intonation would inevitably lead to variation in the acoustics of word stress.

Against this backdrop, we tested Dutch-learning infants (14-month-olds, 24-month-olds) in a looking-while-listening paradigm, in which they saw pairs of pictures with an iambic (weak-strong) or trochaic (strong-weak) target word and a distractor word. The target words were produced with either correct or incorrect word-stress in a question sentence ('Zie je een .... 'Do you see a...?') or in an imperative sentence ('Kijk naar het/de .... 'Look at the ....!). The intonation was either correct (defined as typical for the carrier sentence), i.e. L*H H% on the noun in questions but H*L L% on the noun in imperatives, or incorrect (defined as atypical for the carrier sentence), i.e. H*L L% on the noun in questions but L*H H% on the noun in imperatives. Fig. 1 illustrates these conditions in the 'zie' sentences. We analysed the looking times to the target picture in two time frames (TF): 1 second (TF1) and 2 seconds (TF2) starting 365ms after the word onset. In this procedure, better recognition was assumed to be reflected in a longer looking time to the target picture.

We found that the target words were recognised by both the 14- and the 24-month-olds regardless of whether the stress and intonation were correct. Importantly, the two groups of children differed in both how early in the process of word recognition they showed sensitivity to word stress and intonation and how exactly the two variables affected their word recognition. More specifically, the 14-month-olds appeared to have processed word stress and intonation only in TF2 but showed no sign of integrating these two factors in word recognition. Correct intonation led to a better recognition; correct stress had such an effect only in trochaic words. In contrast, the 24-month-olds showed sensitivity to word stress and intonation already in TF1. They anticipated the intonation in the target word and looked at the target picture longer when the pronounced stress pattern acoustically accorded with the anticipated intonation pattern. In TF2, they processed the produced stress pattern and the produced intonation in an interactive fashion: correct stress facilitated word recognition only when intonation was incorrect. When the intonation was correct, incorrect stress triggered a longer looking time, indicating a surprise effect of incorrect stress.

Our results thus provide the first evidence that children can integrate word stress and intonation in word recognition at 24 months.
References

Appendix

![Figure 1. The word ‘konijn’ in the ‘zie’ sentence spoken with correct stress and incorrect stress in correct intonation and with correct stress and incorrect stress in incorrect intonation. The syllable that was stressed in each condition was printed in capitals.](image)