

THE PHONETIC FUNCTION OF RISE AND DECAY TIME IN SPEECH SOUNDS,  
A PRELIMINARY INVESTIGATION

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Among the various ways in which speech sounds may differ phonetically or linguistically, such as formant structure, periodicity etc., differences in rise and decay time of the amplitude envelope have received only limited attention in the literature.

In this paper I present a concise survey of the literature, from which two conclusions will be apparent: (a) rise and decay time may indeed contain relevant cues for phonetic/phonemic distinctions, but (b) none of the experiments reviewed safely ruled out all alternative explanations for the effects reported. Moreover, there are hardly any psycho-physical data on the discriminability of rise and decay times, and the results in the only published study on this problem, suggesting increasing sensitivity with longer reference rise/decay times, and categorical perception (Cutting and Rosner, 1974), are counterintuitive.

Before investigating rise and decay time phenomena in a phonetic/linguistic context, however, we felt that more detailed knowledge of JND's of rise and decay time in non-speech stimuli would be in order.

The paper presents the results of our first attempt at establishing these JND's using an adjustment method. Rise and decay times of 1000 Hz sine waves and white noise bursts turned out to have JND's in the order of 25% of the reference signal. Separating out the results for the 4 different signal conditions used (sine/rise, sine/decay, noise/rise, noise/decay) shows that the discrimination curves generally overlap. Performance in the sine/rise condition, however, was slightly better throughout, and a remarkable increase in sensitivity occurs with longer decay times (50-100 msec) of noise bursts. Finally, no traces of categorical perception were found.

Reference

Cutting, J.E. and B.S. Rosner (1974): "Categories and boundaries in speech and music", Perc. Psych. 16, 564-570.