Title
Building Lexical Neighborhoods

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The neighborhood activation model (NAM) (Goldinger, Luce, and Pisoni, 1989; Luce, 1986; Luce, Pisoni, and Goldinger, 1990) hypothesizes that spoken word recognition is characterized by two successive stages: (1) similarity neighborhood activation, and (2) a frequency-biased decision process. In the first stage, stimulus input (i.e. a spoken word) activates a set of similar sounding representations of words in memory. In the second stage, these multiply activated form-based representations --or neighbors-- are decided among by a decision process that is influenced by the acoustic-phonetic similarity of the neighbors as well as their frequency of occurrence. NAM further posits that the decision process among the competitors in the activated set of representations is influenced by three characteristics of the similarity neighborhoods. These characteristics are: (1) target word frequency, (2) neighborhood density, and (3) neighborhood frequency.

The present research was aimed at elaborating and extending previous work on NAM by directly manipulating the composition of the similarity neighborhoods of nonword targets. We attempted to directly manipulate similarity neighborhoods for two reasons. One reason is that previous experiments used estimates of the neighborhood characteristics for the words used as stimuli. Like all estimates of subjects' knowledge derived from indirect measures, there is some noise associated with the measurement. Consequently, past studies could be considered somewhat correlational, in that the characteristics of the stimuli were not directly manipulated. The control and direct manipulation of neighborhood characteristics would allow us to explicitly test the variables that NAM claims are at work in spoken word recognition and avoid the problems of estimating neighborhood characteristics.

The second reason for directly manipulating similarity neighborhoods was to examine a claim of Bard and Shillcock (1993) that the presence of a single high frequency neighbor --and not density per se-- determines the speed and ease of spoken word recognition. This claim is motivated by the correlation between neighborhood frequency and neighborhood density. Thus, one can not, according to Bard and Shillcock, easily distinguish what is responsible for neighborhood effects: the frequency of the neighbors or the number of neighbors. They suggest that just one high frequency neighbor may be responsible for producing effects similar to those reported earlier. This account proves to be an interesting challenge for the neighborhood activation model.

The present research constitutes an attempt to directly manipulate the composition of similarity neighborhoods of spoken nonwords. In particular, we established a baseline measure of reaction time to a set of nonword target stimuli. Subjects were then exposed to dense and sparse similarity neighborhoods of nonwords that varied in their frequency of presentation in several sessions of a continuous recognition task distributed over four consecutive days. We then examined the effects of target frequency, neighborhood density, and neighborhood frequency on processing times for the target nonwords in an attempt to directly test the predictions of the neighborhood activation model of spoken word recognition.

The results showed a cross-over interaction between target frequency and neighborhood density. This study demonstrates that target frequency and neighborhood density have demonstrable influences on processing. Specifically, high frequency targets with sparse neighborhoods were responded to more quickly with training, while high frequency targets with dense neighborhoods were responded to more slowly after training. Conversely, low frequency targets with sparse neighborhoods were responded to more slowly with training, whereas low frequency targets with dense neighborhoods were responded to more quickly after training. In addition, no effects of neighborhood frequency were found, contrary to the claims made by Bard and Shillcock.

The results for the high frequency targets are consistent with the predictions of NAM. However, the obtained results for low frequency words directly contradict the predicts of NAM. One possible explanation for the inconsistency between the obtained results and the predictions of the model may be the fact the neighborhood activation model may not accurately model the processes and representations used in word recognition.