Previous work (Tuller, Case, Ding, & Kelso, 1994; Case, Tuller, Ding & Kelso, 1995) revealed signature properties of nonlinear dynamical systems in how people categorize speech sounds. The data were modeled using a two-well potential function that deforms with stimulus properties, is sensitive to context, and reflects the combined effects of long-term temporal factors such as learning. Two of the model's predictions (unexpected on other theoretical grounds) were evaluated: (1) if the effects of learning are minimized, there will be more hysteresis (assimilation) than contrast, and (2) switching is dependent on systematic changes in an acoustic control parameter, not solely on number of stimulus repetitions. A "say"-"stay" continuum was created by inserting silence between a natural “s” and a synthetic “ay” from 0 ms to 76 ms in 4 ms increments. In one experiment, subjects (N=25) were presented with a single run of stimuli with gap duration first increasing from 0 to 76 ms then decreasing back to 0 ms gap duration. Another group of subjects (N=25) was presented with a single run of stimuli that began at 76 ms gap duration, decreased in 4 ms steps to no gap, then increased back to 76 ms gap duration. The subjects' task was to identify each stimulus as "say" or "stay." A subject's pattern of responding (hysteresis, critical boundary, or contrast) was determined by comparing the gap durations at which the perceptual switch occurred in the increasing vs. the decreasing portion of a run. In a second experiment, subjects (N=61) were first presented with a single trial with gap duration either increasing or decreasing. If, for example, a subject heard a switch from "say" to "stay" on the 6th stimulus then in the second trial the first stimulus was presented 5 times, then the stimulus on which the subject previously switched was presented, and the trial then continued to the end. This task determined whether the number of times a stimulus is categorized as the same syllable is a primary factor in the perceptual switching pattern, or whether the movement through the acoustic space (though all are still perceived as the same syllable) is a greater influence. Results showed that 1) on single trials, hysteresis is far more prevalent than either critical boundary or contrast, and 2) sequential acoustic change, rather than simply perceptual repetition, enhances hysteresis. Results of both experiments confirm model predictions. [ Funded by NIMH Grants MH42900 and T32-MH19116. ]