

Most models of perceptual decision latencies assume that subjects accumulate stimulus information from many psychological samples (e.g., random walk models, counter models, Grice accumulator models, leaky diffusion models). This class of models was tested in a choice response time paradigm in which (1) the foreperiods were random and; (2) the onset of the stimulus was either virtually instantaneous (stepped) or slowly ramped. The ramped stimuli were arranged such that ramped section always preceded the stepped onset of the corresponding stepped stimuli. This did not occur. There is an interaction with better performance to stepped stimuli than ramped stimuli in earlier foreperiods and the reverse in later foreperiods. In the fixed foreperiod experiment, there are subject specific biases with some subjects performing better to ramped stimuli and other better to stepped stimuli. A new model is proposed to account for these results which uses an accumulator, a differentiator, and a deadline. Subjects first differentiate the stimulus samples which, although produces a decision quickly, is unreliable. If the subject fails to discriminate the stimuli with the differentiator by the deadline, they switch to the slower, but more reliable accumulator. This model not only explains the interaction and the subject specific biases, but explains the effects of manipulating, intensity, foreperiod timing, speed accuracy tradeoffs, and the proportion of stepped and ramped stimuli.