ASSESSING SINGLE- AND DUAL-PROCESS ACCOUNTS OF RECOGNITION MEMORY USING HIERARCHICAL BAYESIAN MODELS

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ABSTRACT

Recognition memory refers to a person's ability to recognize something that has been previously encountered. For several decades recognition memory has been thought to be governed by a single process whereby the strength of a memory for an item dictates whether people judge the item as having been previously encountered or not. More recently, it has been proposed that recognition memory is governed by two, independent processes: Sometimes a memory judgement is based on strength, sometimes it is based on explicit recollection. Whereas this two-process theory has been embraced by many researchers, others claim that only one process is necessary to explain recognition memory. Here, I argue that all previous evidence for both the one and the two-process theories is questionable — because all models of recognition memory are non-linear models, averaging data over factors that vary (e.g., items) will distort the conclusions drawn. In all previous work it has been necessary to average data over items in order to fit formal models. To avoid the distortions from averaging, I develop hierarchical versions of popular recognition memory models that simultaneously account for person and item variability. These models are fit to data from several experiments to assess the veracity of previous claims. The results of this hierarchical modeling suggest that 1) ROC asymmetry, which has served as strong evidence for particular one and two-process model, is not an artifact of averaging, 2) The Yonelinas two-process model provides a superior account of recognition memory data when compared with the unequal-variance signal detection model via the DIC model-fit statistic, and 3) Two-process model fits reveal that estimates of recollection and familiarity co-vary across items and people. Moreover, manipulations of depth-of-processing, perceptual match-mismatch, response deadline, and list length all affect both recollection and familiarity to some degree. This result implies that, although the two-process model is the best-fitting parametric model, the data are being generated from a yet-to-be specified one-process model.