MBS 95-08

Multinomial Models for Measuring Storage and retrieval Processes in Paired Associate Learning

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This paper develops both a family of multinomial processing tree models designed to assess the relative contributions of storage and retrieval process in paired associate learning, and addresses issues of statistical inference for member models. the models are based on the results of successive free recall and cued recall tasks. The family is composed by making various, plausible assumptions about the nature of secondary processes such as forgetting and single item recall. Close-formed expressions for parameter maximum likelihood estimators are derived for several member models, and based on these the following three statistical issues are addressed: (1) the effect of parameter variability from individual subject-item differences; (2) the applicability of asymptotic formulas to finite sample sizes; and (3) the effect of sparse category frequencies. The results of Monte Carlo computer simulations indicate that there are member models which are robust in the presence individual subject-item variation and sparse frequencies for samples as small as 90 times. Member models are used to reanalyze Riefer & Rouder's 1992, Memory & Cognition, 20, 601-611) data on the bizareness effect, which refers to the mnemonic advantage of bizarre or unusual imagery over common imagery. The patterns of results from all applicable member models are similar, namely that bizarre imagery benefited the retrieval of items from memory but not their storage within memory.