The Implicit Learning of Base-rates: Evidence from Working Memory Disruption

Andrew Wismer
University of Central Florida, andrew.wismer@knights.ucf.edu

Corey Bohil
University of Central Florida, corey.bohil@ucf.edu

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Andrew J. Wismer & Corey Bohil
University of Central Florida

ABSTRACT

Base-rates, or relative prevalence in the environment, play an important role in many diagnostic and categorical decisions. For example, in order for a doctor to make an appropriate diagnosis or treatment plan, he/she must be sensitive to the underlying base-rates. Early base-rate research seemed to show that people were insensitive to base-rates and poor at incorporating them into their judgments (e.g., Kahneman & Tverksy, 1973). However, more recent research has shown that people are sensitive to base-rates when they are learned through direct experience rather than presented in summary form (e.g., Bohil & Maddox, 2001; Estes, 1989). Using a category learning approach, the current study sought an explanation for experience-based sensitivity to base-rates through the lens of COVIS theory – a prominent multiple-systems approach to category learning. COVIS postulates that there are separate implicit and explicit systems involved in category learning. Implicit (nonverbalizable) learning is aided by the dopamine release involved in a motor response with immediate feedback while explicit learning relies heavily on working memory for hypothesis testing and verbalizable rule generation. A recent study found that disrupting the implicit learning system during categorization with unequal base-rates led to a weaker influence of base-rates on decision criterion (signal detection β) placement (Bohil & Wismer, 2014). The current study attempted to corroborate these findings by investigating whether the addition of a verbal working memory task immediately after category feedback (disrupting explicit reasoning about category feedback) would affect the influence of base-rates on categorization. In this study, 123 participants completed one of four conditions (observational/response training x short/long feedback processing time). Participants first learned two simple perceptual categories with equal base-rates. After achieving a pre-determined accuracy criterion, participants moved on to the experimental phase with unequal base-rates (3:1) and the inclusion of a verbal working memory task presented either immediately after receiving category feedback (500ms) or after a delay (2500ms). The experimental phase consisted of alternating training blocks (with feedback) and test blocks (without feedback). Half the participants learned observationally during training phases (known to disrupt implicit learning), while half made a classification response during training trials (which supports implicit learning). As predicted, we found that disrupting working memory had no effect on the influence of base-rates on categorization when implicit learning was possible (in terms of decision criterion values determined by signal detection and decision-bound modeling results). Our results support the multiple-systems theory which predicts that disrupting working memory should not affect base-rate sensitivity if sensitivity to base-rates is indeed mediated by the implicit learning system. These findings have implications for devising appropriate training methods for diagnosticians in various fields.