Differences in Implicit vs. Explicit Grammar Processing as Revealed by Hierarchical Weibull Modeling of Reaction Times

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Abstract

Artificial language studies using reaction time-based measures have suggested grammar learning even in participants without awareness of underlying grammatical rules (Leung & Williams, 2011; Batterink, Reber, & Paller, 2014). However, traditional linear analyses of reaction times might not capture qualitative differences between participants with/without conscious rule awareness (Rouder, Lu, Speckman, Sun & Jiang, 2005; Rousselet & Wilcox, in press). In a partial replication of one study (Batterink et al., 2014), participants were exposed to pseudoword articles that were predictive of an accompanying English noun's living/non-living status. Linear analyses showed that both rule-aware and rule-unaware participants exhibited slowdowns to rule-violating trials, indicating grammar learning. Hierarchical Weibull distribution analyses suggested that rule-unaware and rule-aware participants differed in the underlying cognitive mechanisms involved: rule-violating trials affected the processing architecture for both groups but only affected processing speed for rule-aware participants. These results illustrate the potential of yet-underused distribution-modeling approaches for second language psycholinguistics.