Microlevel analysis constrains models of serial learning.

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Models of sequence memory typically rely on either item–to–item associations, or position–to–item associations with a rule for how positions are retrieved and updated. Both classes of models can account for the changes in serial position curves across trials. The serial position curve measures the average recall probability at each list position for successive trials of learning. This function typically shows a large primacy e ect—an advantage for early list items (Drewnowski & Murdock, 1980). The associative chaining model, which relies on item–to–item associations, produces the primacy e ect because the previous recalled item serves as the current recall cue, thus the probability of an error in recall accumulates over output positions. The positional coding model, which uses position–to–item associations, produces the primacy e ect due to edge effects. Items in terminal serial positions can be perturbed to positions in only a single direction, while middle list items can be perturbed to positions in both the forward and backward directions. This results in early list items having a higher probability of recall in the correct serial position.

Serial position curves, however, do not show the behavior of individual items over the course of multiple study-test trials. Extending Tulving's (1964) analysis of free recall, we present an analysis of sequence learning that tracks the acquisition and forgetting of item and order information at the level of individual items across serial positions. This detailed microanalysis of the learning process reveals that serial lists are learned predominately by gaining items in the correct order (Addis & Kahana, in press). A small number of items are recalled out of order, with the order being corrected on a subsequent learning trial. Information, once recalled, is rarely forgotten.

Applying this analysis to a large serial learning data set, we show that while a basic implementation of the positional coding model ts the data fairly well, the associative chaining model fails to make the appropriate types of errors. Yet both models produce reasonable serial position curves, even when tting to the more detailed analysis. This suggests that overall measures of recall such as serial position curves can obscure important information about the learning process.

We followed up with an experiment that disrupted the acquisition of item–to–position associations but preserved nearest–neighbor associations by requiring participants to learn lists with varied starting positions (e.g., Ebenholtz, 1963). Although a pure positional model could not learn these lists, an associative chaining model is only moderately impaired. These ndings point to the development of hybrid models that incorporate both elements of positional and associative coding.

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