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Part-Set Cuing: A Connectionist Approach to Strategy Disruption

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Part-Set Cuing

In a part-set cuing paradigm, when part of a previously studied list of words is provided as a memory aid, a reliable and robust impairment of the non-cued list items results. Since its discovery (Slamecka, 1968; as cited in Nickerson, 1984), this paradoxical phenomenon has been characterized as a persisting enigma in memory research (Nickerson, 1984), of both theoretical and practical concern. One leading informal model, the strategy disruption interpretation (Basden & Basden, 1995), suggests that the part-set cuing impairment results because one's retrieval strategy is changed and differs from the original encoding strategy, following the presentation of cues. The strategy disruption account is thoroughly supported by empirical evidence; however, it has been criticized as theoretically vague and poorly defined. In contrast, the other leading account, a formal model using SAM (Raaijmaker & Shiffrin, 1981), while precise, has been criticized as overly defined, theoretically inconsistent, and unable to account for the full range of findings (Roediger & Neely, 1982). In an attempt to more precisely identify and extend the strategy disruption interpretation, we examine and compare both neural network simulations and human experiments in a part-set cuing paradigm.

The Neural Network

The artificial neural network used was a fully-connected, auto-associative, three-layer perceptron, using a backpropagation algorithm with a learning rate set to 0.1. The network used 15 input and 15 output nodes with a bias, 10 hidden, and 10 context units. The context layer used a 1 to 1 association from hidden units to context units and was fully connected from context to hidden units.

Experiment 1: Human Results

A within-participant ($N=24$) design was used and counterbalanced for list-order, list-cue-order, and randomized part-set cuing. A typical and robust part-set cuing impairment was observed for cued ($M=.35$) versus non-cued ($M=.40$) items, $F(1,23) = 4.99$, $p < .05$.

Experiment 2: Simulation Results

A within-simulated-participant ($N=24$) part-set cuing design was used and counterbalanced for list-order and list-cue-order, with randomized part-set cues. Output vector error served as the dependent variable and was summed and analyzed for cued and non-cued states. A typical and robust part-set cuing impairment was observed, $F(1, 23) = 24.00$, $p < .05$, without evidence of catastrophic interference.

Conclusion & Discussion

The neural network was consistent with the observed human performance, providing a good fit across a number of analyses. The findings suggest that the neural network formalism is consistent with and may serve as an extension of the Basden and Basden strategy disruption account of part-set cuing. That is, following cuing, different study and activation patterns disrupt the subsequent process of recall. This disruption is caused by a change in the availability and accessibility of cued items, altering the retrieval process and thus the retrieval strategy.

Although the experimental evidence is from a small set, results suggest that the neural network can provide an increasingly precise mechanistic account of part-set cuing impairment that is consistent with the leading informal theoretical account. Future simulations should attempt to replicate key findings including part-set cuing facilitation and category-cuing impairment.

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