Procedural Learning of an Artificial Script Greater with Explicit Letter Instruction

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Introduction

Previous studies have shown that procedural learning is characterized by delayed learning gains after training, termed procedural consolidation (Robertson, Pascual-Leone & Maill, 2004; Stickgold, Hobson, Fosse & Fosse, 2001). This improvement in performance when training is followed by a rest period has been found in both motor and perceptual learning tasks. The current study examined whether procedural consolidation occurs in complex cognitive tasks such as reading acquisition, and whether the reliance on procedural learning depends on the method of reading instruction. The efficiency of letter-instruction versus whole-word instruction has been an ongoing debate in the reading acquisition literature.

Methods

Adult participants received 6 training sessions in reading nonsense words written in a Morse-like artificial script, in which 2 symbols represent a letter. Participants were trained in one of three conditions: alphabetical whole words preceded by letter decoding instruction (Explicit); alphabetical whole words, with no letter instruction (Implicit), and non-alphabetical whole words (Arbitrary). The transfer of learning gains to untrained stimuli was tested in 3 time points during training. Our previous results with this paradigm show letter knowledge in both alphabetical conditions, and pattern knowledge in both whole-word training conditions (Bitan & Karni 2003).

Results

Although performance in all conditions reached a similar level at the end of training, the time-course of improvement was significantly different between the groups. Delayed gains in performance after each training session were found in the explicit condition, resulting in greater improvement BETWEEN training sessions as compared to within session (Figure 1). In contrast, performance in the implicit and arbitrary conditions usually deteriorated between sessions, and improvement occurred primarily WITHIN session. The transfer tests show, in the explicit condition, early letter knowledge with later evolving segmentation knowledge that is generalized to other alphabets. In contrast, the arbitrary condition shows early pattern knowledge which becomes more specific for trained words with time.
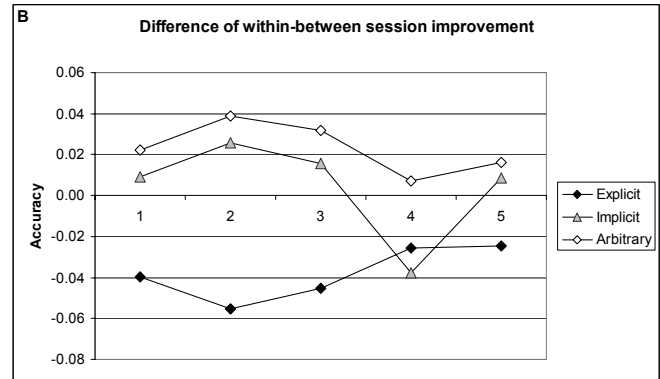

Figure 1: Difference between 'within-session' and 'between-session' improvement. Positive values indicate more 'within-session' than 'between-session' improvement

Discussion

The results suggest that explicit letter instruction resulted in greater reliance on procedural learning, whereas whole-word instruction, of both alphabetical and non-alphabetical words, resulted in greater reliance on declarative memory mechanisms. Furthermore, procedural knowledge, in the explicit condition became more generalized with time, while declarative knowledge in the arbitrary condition became more specific for trained items.

Acknowledgments

References

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