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How is knowledge generated about memory encoding strategy effectiveness?

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Abstract

This study evaluated how people learn about encoding strategy effectiveness in an associative memory task. Individuals studied two lists of paired associates under instructions to use either a normatively effective strategy (interactive imagery) or a normatively ineffective strategy (rote repetition) for each pair. Questionnaire ratings of imagery effectiveness increased and ratings of repetition effectiveness decreased after task experience, demonstrating new knowledge about strategy effectiveness. Cued recall confidence judgments, measuring confidence in recall accuracy, were almost perfectly correlated with actual recall and strongly correlated with postdictions—estimates of recall for each strategy. A structural regression model revealed that postdictions mediated both changes in second-list predictions and changes in strategy effectiveness ratings, implicating accurate performance estimates based on item-level monitoring as the key to updating strategy knowledge.

Keywords: Knowledge updating; Strategy; Associative learning; Metacognition; Monitoring

1. Introduction

Cognitive self-regulation involves selecting strategies appropriate to a task so as to realize one's task goals (e.g., Lemaire & Siegler, 1995; Schunn & Reder, 2001; Siegler & Stern, 1998). According to metacognitive theories, beliefs about the task, oneself, and the repertoire of strategies one has available all can influence initial strategy selection, and whether an individual continues a strategic approach or alters it in the face of performance-goal discrepancies (Bandura, 1997; Dunlosky & Hertzog, 1998b; Pintrich, Wolters, & Baxter, 2000). Hence, knowledge about various strategies and their effectiveness is an important aspect of self-regulation during learning that can influence learning (Hertzog & Dunlosky, 2004; Nelson & Narens, 1990; Schneider & Pressley, 1997; Winne, 1996).

This study examines individual differences in the degree to which people learn about strategy effectiveness, namely, use of an imagery mnemonic for learning new associations between words. A number of strategies exist for forming new association between specific items. If words are associatively related (e.g., SALT–SUGAR), almost any technique, including repetition, will facilitate learning (Dunlosky & Hertzog, 1998a); but for unrelated words (e.g., TICK–SPOON), a relational mnemonic, such as interactive imagery, that binds the words in an integrated representation is highly effective (Bower, 1970; Paivio, 1978; Richardson, 1998). Mediational strategies, including interactive imagery or sentence generation, lead to superior cued recall when evaluated relative to using no strategy or to using a technique like rote repetition—simply repeating the words aloud. This paper focuses on the role that monitoring cued recall plays in learning about differential strategy effectiveness, and how these differences translate into updated declarative knowledge that could, in principle, be accessed to guide strategy selection at a different point in time, or in a different task context.

In the remainder of the Introduction, we describe a metacognitive framework about knowledge updating during task experience that frames the important questions addressed in the present study. This framework assumes that gaining accurate knowledge about strategies is based on accurately monitoring the effects of those strategies during study and test. We discuss

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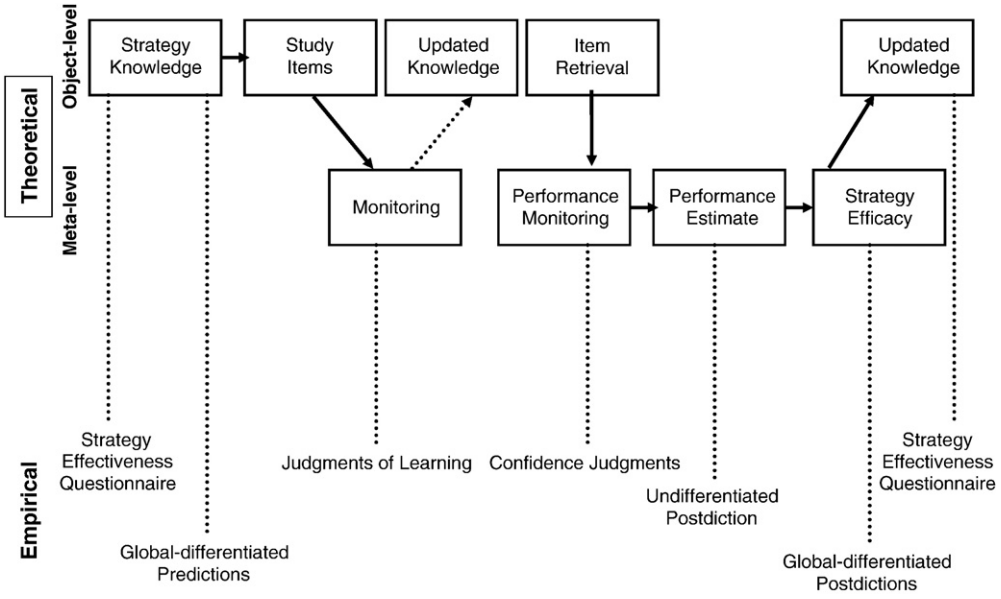

Fig. 1. Conceptual model of strategy knowledge updating. The boxes in the top section represent conceptual/theoretical processes. Dashed lines below the boxes link methods of measuring change in constructs such as knowledge updating, including different types of metacognitive judgments.

evidence that supports the framework. In doing so, our goal is to present a more complete model of acquiring declarative strategy knowledge that serves as the basis for understanding the empirical analyses of individual differences in monitoring processes and strategy knowledge updating that follow.

1.1. A metacognitive model for learning about strategy effectiveness

Fig. 1 presents a conceptual framework for how individuals learn about the effectiveness of different strategies in a paired associate (PA) learning task. Two critical assumptions of the framework are that (a) encoding strategies vary in relative effectiveness for later memory, and (b) individuals experience and evaluate variability in strategy effectiveness by monitoring their study experiences and test outcomes. More specifically, such strategy variability (Siegler & Stern, 1998) is considered an important part of creating knowledge about differential strategy effectiveness (Crowley, Shrager, & Siegler, 1997; Lovett & Schunn, 1999; Pressley, Levin, & Ghatala, 1984). Given variability, knowledge updating requires that individuals (a) monitor encoding strategies during the time of learning and/or monitor performance outcomes when tested for new associative learning, and (b) link these monitoring outcomes to the encoding strategies. Thus, monitoring of encoding and retrieval processes during study and test are central to this metacognitive framework (e.g., Nelson & Narens, 1990; Winne, 1996). A critical question is: At what point during task experience do people gain knowledge about strategy effectiveness?

The framework in Fig. 1 contains multiple pathways by which knowledge updating could occur. It also includes how different metacognitive judgments and questionnaires can be used to evaluate strategy knowledge at different points in the PA task.

1.1.1. Pre-experimental strategy knowledge

A starting point is the knowledge that people already have about strategy effectiveness before the experiment, which can be measured by questionnaire ratings of strategy effectiveness (e.g., Hertzog & Dunlosky, 2004). We argue that maximal validity will be attained by measuring knowledge about strategies that are specifically appropriate to the target task (Hadwin, Winne, Stockley, Nesbit, & Woszczyna, 2001; Hertzog & Dunlosky, 2006). The present study uses a questionnaire designed to assess people's beliefs about the effectiveness of strategies for associative learning, which is first administered before the task begins.[1] People often show minimal pre-experimental knowledge about mediational strategies and their effectiveness (Hertzog & Dunlosky, 2006), making it possible to track *newly gained* knowledge about the strategies as people experience using them.

Prior knowledge can also influence initial *global predictions* about overall performance on the task. Metacognitive research has a long history of asking people to make global predictions. Predictions made prior to task experience (e.g., how many items will I remember on this memory test?) are notoriously inaccurate (Herrmann, Grubs, Sigmundi, & Grueneich, 1986; Hertzog, Dixon, & Hultsch, 1990; for an exception, see Ackerman, Beier,

[1] It remains possible that asking individuals to rate the effectiveness of different strategies before beginning the paired associate learning task and to provide item-level strategy reports after studying each item could have reactive effects and result in greater or different strategy use than would occur if strategies were not rated and reported. However, we intentionally altered strategy use by instructing participants to use either imagery or repetition to study each item, which provided structured experience using each strategy and allowed examination of the point at which knowledge updating occurred.