

there has been relatively little attention to the metacognitive processes associated with visual processing (for exceptions, see Busey et al., 2000; Chun and Jiang, 1998; Levin et al., 2000; Winer et al., 1996a; Winer et al., 1996b). The dramatic results from change blindness paradigms, such as failing to notice that one's conversation partner has changed identity mid conversation (Simons and Levin, 1998) underscores the need for more appreciation of the mechanisms involved.

Experiments in this area have found that participants are unable to predict their poor performance in change detection scenarios. The metacognitive errors seem to involve a systematic overestimation of human cognitive capacity in processing. Perhaps this overestimation is based on a lifetime of accurate (or seemingly accurate) perception of visual scenes, which results from the adaptive nature of metacognition, as addressed later in the chapter. Is visual metacognition as inaccurate as we have suggested above? If so, why? Can we understand visual metacognition by relating to previous research on metacognition that focused on semantic knowledge? In this chapter, we propose answers to all three questions.

What Is Metacognition?

Noting that the term *metacognition* seems to have different meanings for researchers in different subdisciplines of cognitive science, Reder (1996) asks whether these researchers have simply focused on different aspects of the same concept or whether there is actually a collection of different concepts that have all been labeled with the same term. "Metacognition" has been used to describe theory of mind, cognition about cognition, beliefs, monitoring of cognitive performance, and strategy selection. Although it has often been assumed within these areas that metacognitive functioning involves the conscious awareness of activities within the mind, we will present evidence that strategy selection and monitoring of cognitive performance are not always conscious. If this is so, it would seem that, to keep consciousness as a criterion, we would have to limit metacognition to a far narrower set of activities.

When we assume that metacognition is unconscious in some situations, we leave open the possibility that it may occur automatically, with no prompting from conscious systems. For the purposes of this chapter, we assume that metacognition refers to information about our cognitive state and that it is often associated with the control of behavior and the selection of control procedures to achieve a goal. We believe that such procedures, though sometimes conscious, are often automatic and part of a larger cognitive process (Cary and Reder, forthcoming; Reder and Schunn, 1996).

Feeling of Knowing: An Illustration

Classically defined as the state of believing that a piece of information can be retrieved from memory even though it currently cannot be recalled, feeling of

knowing (FOK) is a research paradigm that has led to much debate over the character of metacognition. People often experienced FOK as a tip-of-the-tongue phenomenon, when they are not able to retrieve an item from memory, but feel that they should be. Recent research has suggested that feeling of knowing includes a rapid, automatic process beginning prior to actual memory retrieval and determining the course of the retrieval process (Miner and Reder, 1994). According to this proposal, an FOK judgment often occurs within retrieval, but it becomes consciously available only when retrieval fails (as in the tip-of-the-tongue phenomenon) or when participants are asked to search for and report their judgment. When conceptualized as an automatic process in the procedure of memory retrieval, feeling of knowing can be tested by asking participants to make judgments about their ability to retrieve an item before they actually attempt retrieval. These judgments can then be compared to the participants' actual ability to retrieve and to characteristics of the question or problem itself. Despite evidence presented earlier that metacognition is often inaccurate, FOK ratings are highly related to performance on cued-recall tests, relearning rates, and feature identification. Participants are able to successfully predict correct recognition and recognition failure (Miner and Reder, 1994). Accuracy in this paradigm is well above chance, but not nearly perfect.

Several mechanisms have been proposed to account for the accuracy of feeling of knowing judgments. The trace access hypothesis suggests that, when a question is asked, there is an immediate partial retrieval of the answer, which enables participants to monitor some aspects of the target item and decide whether they will be able to fully retrieve the answer (e.g., Nelson, Gerler, and Narens, 1984). This hypothesis accounts for the ability of someone experiencing the tip-of-the-tongue phenomenon to recount the first letter or number of syllables of the desired word. The cue familiarity hypothesis suggests that FOK judgments are actually based on a feeling of familiarity with the question itself. Cues that are associated with the question or the context provide evidence as to the likelihood of retrieving the answer. This hypothesis predicts that as cue familiarity increases, so should the FOK judgment. For example, frequency of exposure to unfamiliar math problems was correlated with higher FOK judgments, even when only part of the problem was familiar (Reder and Ritter, 1992).

The evidence that feeling of knowing judgments represent a rapid preretrieval stage in memory leads one to ask what purpose FOK is fulfilling in retrieval processing. Research suggests that FOK judgments act as an automatic strategy selection device (Reder, 1988). The automatic determination whether a response can be retrieved allows one to quickly decide whether a memory search is a worthwhile expenditure of resources. If the item is judged to be unfamiliar and thus not retrievable, then one can quickly decide to look for the answer by using another strategy, such as calculating a math problem or researching a question (Reder, 1982, 1987; Reder and Ritter, 1992). This type of judgment could also be used to determine how long to continue a search before conceding that another strategy