

should be used. If the FOK judgment were strong, one would allow the search to continue for a longer period of time. Research shows that FOK judgment has a positive correlation with duration of search (Gruneberg, Monks, and Sykes, 1977; Nelson, Gerler, and Narens, 1984).

#### *Strategy Selection Can Be Unconscious*

A number of experiments have shown that participants can select and use strategies they are unaware of. For example, when experimental designs vary the base rates of the usefulness of various types of problem-solving strategies, participants' results indicate that they adapted their base rates of selecting among these strategies. Interestingly, although the data clearly suggest these adaptations, postexperimental interviews indicate that participants are often unaware of the manipulation of base rates. In an experiment where participants were required to judge the plausibility of statements based on a story they had read, they were unaware of the strategy they used or the likelihood that retrieval would be successful (despite strong adaptation). All participants believed they had used direct retrieval, even when that strategy was not possible (Reder, 1987).

Likewise, strategy selection in verification of math equations was shown to be sensitive to rates of success with the verification strategies. Thus, if many of the equations could be judged as false because they violated the parity rule (where the sum is even when the addends are both even or both odd), participants became more likely to test all equations for parity, although they claimed to be unaware that one strategy was more successful than another (Lemaire and Reder, 1999). On Lovett's "building sticks" task (Lovett and Anderson, 1996), where the probability of a successful "overshoot" versus "undershoot" strategy was varied, the results showed that, although the base rates of strategy success had an effect on strategy selection, participants did not accurately explain their behavior.

Even low-level strategies can be affected implicitly by base rates of success. When participants are asked to respond to a target item in one of several locations while ignoring the distractor item that appeared in one of those same locations, their performance was affected by the frequency with which distractors appeared in specific locations (Reder and Weber, 1997). Over time, participants learned to prefer to examine certain locations and to ignore others, based on the probability of a target or distractor appearing in that location. When questioned at the end of the study about the distribution of distractors over the locations, however, they were unaware of any differential distribution. Chun and Jiang (1998) were able to affect the strategy used to detect a target by providing repeated contexts that predicted the location of the target. Whereas participants detected targets more quickly when the configuration of stimuli was repeated than when it was novel, they were at chance in discriminating repeated from novel configurations. Although we would hesitate to label these low-level tasks

"metacognitive," they do provide evidence that search strategies can be affected implicitly.

#### *Why Is Metacognition Sometimes Unconscious?*

Thus, as we have shown, people are sometimes unaware of what causes them to select one strategy over another, and even of what strategy they may be using. We propose (see Reder and Schunn, 1996) that people are unlikely to be aware of the resulting strategy when the process requires rapid execution; that metacognition, in general, may be unconscious when the time course of processing is short; that cognitive monitoring, typically assumed to be a conscious process, may actually operate without much awareness; and that control of cognitive processing may be governed by implicit learning and memory.

There is a reason why metacognitive processes should be automatic and unconscious. When conscious control of metacognitive activity is not required, other cognitive resources are released and can be used in cognitive processing. Furthermore, metacognitive processes are less likely to interfere with regular cognitive processing if they are unconscious. For example, during a task that requires quick and accurate responses, the mind is able to monitor target location probabilities and adjust strategies without interfering in the rapid response to targets we are consciously aware of. Koriat (2000) has proposed that metacognitive feelings are an interface between automatic processing and consciously controlled processing and that experience-based metacognitive processing, which consists of a transition from low-level experience to high-level experience, may be implicit, whereas information-based metacognitive processing, involving analysis of higher-level experiences, is always explicit. Koriat allows for the possibility that these automatic cognitions can influence behavior and that "consciousness is not the sole gateway to action."

Other theorists have also supported the idea that metacognition may be unconscious under certain conditions. Defining *metacognition* as beliefs and opinions about our beliefs and opinions, Graham and Neisser (2000) maintain that, because our first level of beliefs and opinions (such as thoughts about "family and friends, Mahler's Fifth, and avocados") can be implicit, it is unreasonable to assume that our second level (our opinions about those earlier thoughts) must never be. Based on their work with a blindsight patient, Kentridge and Heywood (2000) make the argument that metacognition is not inherently conscious, that awareness might not always be necessary for changes in automatic processing to occur. Their patient could not see in certain regions of the visual field; this failure of an automatic process (vision) led to its replacement with another, unconscious strategy, outside the patient's awareness. The blindsight patient was able to orient his attention within the field of vision loss such that his reaction time to stimuli he could not consciously see was sped up by cues he could not consciously report.