DIFFERENT RESEARCH PROGRAMS ON METACOGNITION: ARE THE BOUNDARIES IMAGINARY?

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ABSTRACT: This commentary asks whether the term "metacognition" means different things to researchers working in different subareas of cognitive and developmental psychology or whether they are just studying different aspects of the same underlying construct. The four articles in this special issue seem to be addressing phenomena that frequently share little except a label. Some of the phenomena that are called metacognitive necessarily involve conscious processing; however, other phenomena addressed in this issue, such as self-regulating behaviors, are typically executed without conscious awareness.

The goal of this special issue, in the words of its editor to the contributors, is to:

"...bring together different research programs on metacognition in a common forum. Far too often, the literature on metacognition is unnecessarily compartmentalized with the result that the reader finds it difficult to gain an adequate appreciation of the many sides of metacognitive research and their relevance to one another. In my opinion, we should strive to eliminate these imaginary boundaries—my hope is that this issue will serve as a starting point."

This is indeed a laudable and potentially important goal when one considers the wide variety of subdisciplines that have chosen to study metacognition. Given that the articles in this collection are so varied in content, it is useful to clarify what is meant by the term metacognition in each paper. Clearly if metacognition is to be studied by people in many different sub-disciplines, there is a need to understand what is common in their approaches. Are the sub-disciplines within metacognition more related than other sub-disciplines in cognitive and developmental

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ISSN: 1041-6080

psychology? It is important that we understand whether and how these groups' definitions of metacognition differ. Perhaps the most basic question concerns whether there exists a unified construct that underlies the various approaches to the study of metacognition.

The four articles in this issue discuss different topics but share an interest in metacognition, learning and individual differences. The connotations or denotations of metacognition expressed across and within these articles include cognition about cognition, theory of mind, beliefs and desires, and the monitoring and control of cognitive performance and activities, such as strategy selection. Bartsch and Estes are concerned with individual differences in children's development of theory of mind. Alexander and Schwanenflugel discuss the development of metacognitive concepts and thinking in gifted and nongifted children. Winne discusses individual differences in self-regulated learning. Kaszniak and Zak discuss the neurobiologic correlates of metamemory, focusing on deficit-awareness in patients suffering from amnesia and dementia.

What seems common to all of these views is that they assume that normal metacognitive functioning involves a conscious awareness of a set of mental activities. It is not clear to me, however, that the phenomena that these authors explore are, in fact, different facets of the same general construct. In the following commentary I suggest that metacognition not only means different things to these different groups, but that in some cases these distinctions are mutually exclusive.

DISSOCIATIONS BETWEEN METACOGNITION AND COGNITION.

In discussing the neuropsychology of metamemory, Kaszniak and Zak emphasize the dissociations between impairments that could be classified as either metacognitive or basic cognitive. If metacognition means self-knowledge about one's own cognitive functioning, as has been suggested by others (e.g., Flavell 1979; Metcalfe & Shimamura 1994), then patients with a certain class of deficit can be said to have damage to that region of the brain that supports metacognition. The region that appears to be implicated is the frontal lobes. Their finding of anosognosia, that some patients are totally oblivious to their neurological deficits yet seem ready to admit other shortcomings, is both intriguing and compelling for the view that these processes are independent. The implication of the frontal lobes in metacognitive processes is bolstered by evidence from Janowsky, Shimamura, and Squire (1989), who find impairment in metacognitive judgments such as feeling of knowing for non-amnesics who also have focal frontal lobe damage. They focus on clinical populations suffering from amnesia and dementia and provide evidence that there is a separate part of the brain that supports metacognitive functioning.

Kaszniak and Zak were concerned about establishing the validity of dissociations across clinical impairments in order to implicate certain brain structures as

central to specific classes of cognitive processes, notably, metacognitive processes. One might ask however, whether patterns of dissociation between metacognitive and cognitive performance should exist more generally. That is, if there exists a real metacognitive component in a different region of the brain, then perhaps the same logic should be extended to normal populations. That is, why shouldn't there be a comparable dissociation in performance between normal cognitive functioning and metacognitive functioning? If metacognition is parasitic on cognition, these processes might not be independent; however, if it were the case that individual differences in metacognition were uncorrelated with individual differences in general cognitive functioning, I think this would be stronger evidence for the psychological reality of the distinction.

The issue of interdependence between metacognition and cognition is central to the article by Philip Winne. The focus of his article is on individual differences in self-regulated learning (SRL) as a type of metacognitive behavior. The discussion gives heavy emphasis to judgments of learning (JOLs) as well as self-regulated learning. The clear inference from his article is that these judgments of whether to continue studying, whether one knows the information well enough to retain it later, etc. are metacognitive. One would wonder, however, whether there is likely to be a dissociation between individual differences in SRL and other cognitive performance. That seems doubtful. Certainly the ability to regulate learning will be highly correlated with cognitive performance. Therefore, to the extent that JOLs and SRL represent metacognitive processes, they are probably not dissociable from normal cognitive functioning. I suspect that Winne believes that they should be correlated because the meta level operates on the object level; however, if the so-called metacognitive judgments are as correlated with cognitive performance as are any two cognitive skills, one has to ask whether there is anything special about them. Perhaps self-regulation is just another cognitive skill.

SELF-REGULATION AND CONSCIOUS CONTROL

All the authors in this special issue seem to agree with Tulving's (1994) claim that consciousness is a necessary condition of metacognitive judgments. Consistent with that view, Winne maintains that most selection among strategies (or tactics as he calls them) are conscious and deliberate. In contrast, I believe that the majority of self-regulatory processes are not conscious. Elsewhere I have argued that the decisions about whether to search and how long to search is implicit and automatic (e.g., Miner & Reder 1994; Nhouyvanisvong & Reder in press; Reder & Schunn 1996). Reder and Schunn (1996) presented the case that much of the processes that regulate strategy selection, i.e., the types of processes discussed by Winne, are driven by implicit processes. Even Winne cites (p. 10) work that there are many automated tactics among experts (e.g., Rabinowitz & McAuley 1990), and automaticity suggests less conscious control. There is evidence that strategy automation or preferences for a tactic become automated quite rapidly and shift regularly as the circumstances warrant and frequently with no awareness by the learner that such strategies (or tactics) are developing (Lemaire & Reder manuscript submitted;

Reder 1987; Reder & Schunn in press) . There is reason to believe that people's reports about their choices and reasons for choosing are actually attributions made after the (implicit) decision has been reached (e.g., Lovett & Anderson 1996; Nisbitt & Wilson 1977; Reder & Schunn 1996; Wilson & Schooler 1991) Consistent with this perspective, Winne describes a study by Hunter-Blanks, Ghatala, Pressley, and Levin (1990) that failed to find an improvement due to conscious efforts to adapt strategies or tactics.

In Winne's article there is the suggestion that individual differences in efficacy of SRL are manifest in conscious processing. He states "Monitoring is a decision making process and hence, individual differences that affect decision making would also be expected to affect SRL (pp. 21)." Contrary to this suggestion, Reder and Schunn (in press) found that individual differences in adaptation can occur in contexts where the task leaves very little room for conscious deliberation. In Kanfer and Ackerman's Air Traffic Controller task (Kanfer & Ackerman 1989, also described by Winne), we found that we could predict individual differences in whether tactics were adapted to allow optimal performance and that we could predict speed and amount of adaptation. This task is a very fast moving computer game that does not lend itself to conscious deliberation. Moreover, the pattern of behavior mirrored results I have found elsewhere (Lemaire & Reder, manuscript submitted; Reder 1987) where subjects were interviewed and found to be oblivious to an manipulation of context. Despite this lack of awareness of any manipulation, subjects' performance, in terms of shifting tactics or strategies, was large and in the predicted directions.

AUTOMATICITY AS A PARAMETER OF SRL

Winne proposes that that self-regulating tactics will follow the same developmental path that Fitts (1964) claimed happens for all skills, specifically, progressing though cognitive, associative and automated phases. Fitts' ideas have been formalized in a cognitive architecture that embraces both a procedural and declarative component to memory and skill acquisition (Anderson 1982, 1987). One of the features of automatic and procedural skills is that, unlike declarative skills, they are not open to introspection (Anderson 1993). The notion of procedural and declarative components to memory has more recently been embraced by other psychologists, (e.g., Squire 1992) because it makes clear that certain aspects of cognition are implicit and unaffected by clinical pathologies such as amnesia.

Winne suggested that SRL starts out as a conscious or aware process and over time may become automatic and unconscious. This seems plausible given that strategy adaptation often occurs without conscious awareness and that self reports of this adaptation prove to be conjectural and inaccurate (e.g., Reder & Schunn 1996). I wonder whether Winne means that as a small child one is initially conscious of how to adapt but that as an adult, one learns to select tactics automatically. Or, does he mean that for each new task the strategy choices begin consciously and ultimately evolve to be automatic and unaware? I hope he means the former: in my laboratory I have interviewed college age students

who believe that they know what variables are influencing their performance, but in fact they do not. Despite the fact that they are unaware of the actual manipulation, their performance is strongly influenced by it.

METACOGNITION IN CHILDREN

Bartsch and Estes posit that the development of an understanding of cognitive states, i.e., metacognitive competence, arises from an understanding of noncognitive states, such as desires and emotions. They focus on an individual's development of a theory of mind, i.e., an understanding of one's cognitive behavior. Their proposal and call for a richer examination of the links between cognition and emotion is a good suggestion. As discussed above, I believe that much more of metacognitive behavior is implicit than is generally acknowledged. Therefore, it also seems likely that more of cognition and even metacognitive control is influenced by emotional states.

Bartsch and Estes are not referring to the development of cognitive behaviors but individuals' ability to understand why particular behaviors occur. They present the reasonable position that social experiences as well as non-social experiences will affect the explanatory mechanisms that children and adults develop to account for behaviors. Consider the question of whether there should be a dissociation between metacognitive performance and cognitive performance, i.e., that individual differences on measures of metacognitive performance should not be correlated with individual differences on tests of cognitive ability. Social experiences presumably would have more impact on theories concerned with emotions and desires, and this too is consistent with the view that metacognition and cognition should be dissociable. On the other hand Bartsch and Estes also question the notion of whether specific metacognitive phenomena fit under the description of a theory of mind. I have to agree with this concern because I believe the term metacognition is used too widely.

Alexander and Schwanenflugel's article is also concerned with individual differences in the development of metacognition. However, their focus is not so much in articulating what causes differences in development of metacognition, but rather whether children who are otherwise classified as gifted show qualitatively different (and better) performance on measures of metacognitive ability, especially metacognitive concepts, than do their non-gifted peers. They found no consistently clear difference between gifted and non-gifted children in the development of metacognitive knowledge, and in particular they found no clear advantages for knowledge of metal activity concepts.

From the perspective that metacognitive skills should be dissociable from cognitive skills, this finding could be taken as evidence for the existence of a distinct construct called metacognition. On the other hand, I am more struck by their con-

clusion, like Bartsch and Estes, that it is important to differentiate the types of metacognitive knowledge being investigated. I find myself in agreement. Too often attempts are made to compare and contrast conclusions when the phenomena being measured or the tasks being performed are so qualitatively different that comparisons are difficult at best and inappropriate at worst.

ONE METACOGNITION OR SEVERAL?

There is the obvious temptation to believe that all these perspectives are consistent; however, I believe that there are underlying contradictory assumptions. All of these articles assume that metacognition is an aware process. That seems like a reasonable assumption: The dictionary definition says that metacognition refers to knowledge of one's own knowledge or knowledge of self. On the other hand, another important aspect of metacognition is the notion of control of cognition: that is, selection of strategies, self-regulation of learning, etc. as described by Winne. It seems reasonable to conceive of self-regulation as metacognitive; however, I remain unconvinced that controlling one's own learning activities is primarily a conscious activity. So I am left to wonder whether self-regulation is really a kind of metacognition or not. My preference is to say that it is, but that, because self-regulation is largely an automated, implicit process, not all of metacognition is conscious and aware. It may be that this aspect of metacognition is qualitatively different from aspects covered in some of the other articles. The development of a theory of mind or the belief that people have beliefs seems qualitatively different from skills such as the ability to control how hard one studies, the selection of which strategy to pursue to achieve a goal, or deciding whether and for how long to continue searching memory for an answer.

CONCLUSION

These were all informative and interesting articles, each exploring different aspects of metacognition. I believe the value of this enterprise has been to help remind us that sometimes the same term is used to mean very different things. Some of the articles represented here are not just studying a different side of the same aspect of cognition, but rather are studying something totally different from some of the others represented here. The term metacognition, is being used by different individuals to refer to different collections of behaviors.

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