Cognitive Skills: Clarification or Quagmire?

Ann M. Colley and John R. Beech
(Eds.)
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Review by
Donald G. MacKay

Ann M. Colley and John R. Beech are lecturers in psychology at the University of Leicester (England). They are coauthors of Cognition and Action in Skilled Behavior. ■ *Donald G. MacKay, professor of psychology at the University of California, Los Angeles, is author of* The Organization of Perception and Action: A Theory for Language and Other Cognitive Skills.

Two basic questions motivate this book: how cognitive skills are performed and how they are acquired. Combining these questions is an exciting and important enterprise because, as MacKay (1982) makes clear, the large and interesting changes that occur during acquisition of skilled behaviors usually take place at cognitive levels rather than at the motor or muscle movement level that has been the focus of so much research in the past. And even though this book offers sketchy and problematic answers to these questions, it should prove useful for graduate seminars and for researchers interested in cognition and performance, especially in metacognitive processes and individual differences in cognitive skills.

The book inaugurates a new series that is intended to integrate theories of cognition with research on human performance. To this end, a wide and diverse range of theories is noted, including production models, PDP models, node structure theory, schema theory, theories of arousal, limited channel capacity and multiple resource theories, and current and classical theories of cognitive development. The book gives strong praise to models with distributed nodes functioning in parallel, where the executive homunculus is removed as a decision-making entity, the black box loses its mystery, and models of cognition come "more in line with neurological and neuropsychological evidence" (p. 179). An interesting

critique of the information processing approach is developed but could have been applied elsewhere in the book to models containing opaque boxes with the vaguest of labels, for example, "perceptual processing," "experience," "procedural memory," "executive goals," and "knowledge reorganization." Methodological issues are also examined, especially in Ericsson and Oliver's historical note contrasting traditional approaches to the study of memory with on-line verbal reports of practicing memory experts such as stage actors.

Although much of the book is beautifully written, typos, glitches and grammatical gaffes abound throughout, many bearing the earmarks of computer-assisted word processing. And one could perhaps quibble with repeated reference to concepts such as "bloody-minded findings" (p. 242 and passim). Without further elaboration, such concepts are likely to make this "text" difficult to understand, at least for American students.

As its title suggests, the book focuses on a class of behaviors that the authors label *cognitive skills* (the prototypical example being mathematical problem solving, p. 2) rather than *perceptual motor skills* (e.g., skilled piano playing, p. 2) and *physical skills* (e.g., exerting maximum hand grip, p. 218). A divide-and-conquer strategy underlies this and many other classifications of behavior that have been proposed during the century or so since the advent of experimental psy-

chology: Under this strategy, segregating or subdividing the study of behavior on practical or intuitive grounds seems to promise more manageable research literatures and more coherent bodies of facts and insights (see MacKay, 1982).

However, both the logic and usefulness of this widely adopted segregation strategy have been questioned elsewhere, and similar questions can be raised about the segregation of cognitive versus perceptual–motor versus physical skills adopted here (see MacKay, 1987, pp. 195–197). To begin with, segregating noncognitive from cognitive skills as defined here is tricky. It will not do to simply apply the label *skill* to something that is cognitive (e.g., attention, memory, thinking), as if this label were somehow explanatory rather than in need of explanation. Nor will it do to simply label various skills as *cognitive* skills. After all, "perceptual–motor" skills such as piano playing involve a cognitive component that needs to be understood, and so do "physical" skills: To take just one example, exerting maximum hand grip has been found to interfere with concurrent cognitive activities such as mental arithmetic and reading for comprehension (p. 218). Our goal as psychologists is not just to label tasks and skills: Clarifying the principles underlying the cognitive control and acquisition of skills, however labeled, might have provided a better focus for this book.

Moreover, Colley and Beech's segregation of cognitive from noncognitive skills does not seem to generate a manageable body of facts and insights. For example, lack of coherence is a major problem for this text (despite Dennis Holding's observation in his series preface that this book is more systematically organized and coherent than its predecessors in an earlier Wiley series on human performance, p. xiv). Even though Colley and Beech chose the authors, interacted with some of them at a conference (the International Conference on Skilled Behavior held at Sussex in 1987 under auspices of the Cognitive Section of the British Psychological Association), and systematically shaped the final form of the papers, they themselves lament in their Epilogue (p. 327) that "it is not possible to provide a neat summary" of the contents of their text. Indeed, the book touches on a bewildering variety of topics. Major independent variables appearing in the Table of Contents include (in order) knowledge of results; drugs for treating developmental reading disorders such as dyslexia; various programming

languages such as LISP and PROLOG; aging; noise; sleep loss; effects of alcohol, caffeine, and nicotine intake; and influences of time of day on performance. Major dependent variables include transfer of training, imitation learning, memory for movement, the nature of errors in semiskilled computer programming, and individual differences in skill acquisition, due, for example, to personality characteristics such as introversion-extraversion. Then there is the array of different skills: bridge, chess, climbing stairs, the diving ability of ganets, digit recall, eye movements, social and affective skills, comprehension, thinking, problem solving, creativity, attention (dual task performance), and the mastery of computer programming.

The problem is that the cognitive skills concept adopted here is both fuzzy and fundamentally unbounded and could include, in principle, virtually all of human behavior. This is unfortunate because clear and delimited concepts of cognitive skill are in fact available (MacKay, 1981, 1982, 1987). Moreover, many of the book's topics—for example, the psychology of aging—have already provided the basis for miniature fields with their own conferences, textbooks, and journals. For a book with such scope, omissions become almost as interesting as inclusions. For example, one wonders why this book omits direct discussion of language production, surely the most extensively practiced, proficient, and flexible of cognitive skills (see MacKay, 1981). More generally, one wonders how much more principled Colley and Beech's cognitive skills concept will turn out to be than earlier applications of the divide-and-conquer classification strategy, where skills such as discus throwing could be labeled "typical" and worthy of study, unlike skills labeled "atypical" such as speech production (see Holding, 1981). As a final note on omissions, one wonders why this book contains no direct mention of another recent and very expensive book (Colley & Beech, 1988) that deals with the same issues, derives its impetus from the same conference, is compiled by the same editors, and includes some of the same authors.

Criticisms aside, this volume is a valuable contribution to the skills literature. Although little in the book is genuinely new, it presents concise and neatly organized summaries of a wide variety of research areas and issues that have occupied and will continue to occupy researchers for many decades to come. It also orchestrates the presentation of diverse points of view and facts that cry out for integration at some point in the future. By assembling this selective but broadly based sample from the state of the art, Colley and Beech have done the field a genuine service.

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