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## BOOK REVIEWS

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### The Handbook

DOI: 10.1017/S1355617707071226

*Human Hand Function*, by Lynette A. Jones and Susan J. Lederman. 2006. New York: Oxford University Press. 270 pp., \$65.00 (HB).

Reviewed by MICHAEL P. CALIGIURI, PH.D., *Professor and Director of Clinical Research Protections Program, University of California, San Diego, CA*

Our hands are more than just convenient appendages for supporting our morning cup of coffee and bagel. They are highly evolved effectors capable of performing a vast array of complex tasks and the rapid decoding of multi-sensory information from the environment. *Human Hand Function* synthesizes the empirical evidence on nearly all aspects of hand function. The book is thoughtfully organized. Following the overview in which the authors introduce a conceptual framework of understanding hand function, there is the obligatory chapter on evolutionary development of hand anatomy. This chapter is more than just a review of phylogeny, as the authors link anatomical capacity with functional success and failures throughout the evolutionary ladder. Chapter 2 ends with a brief overview of biomechanical models that left this reviewer wanting more. It would have been nice to see more tables that synthesize complex concepts into a useful format. For example, following the discussion of biomechanical models in Chapter 2, it would have been helpful to see a table that translates various forces the hand is capable of generating into familiar operational behaviors, such as those we engage in daily.

Chapter 3 focuses on neurophysiology. Given the authors' expertise, this translates to sensory physiology. This chapter reviews everything one needs to know about mechanoreceptors, thermoreceptors, nociceptors, and of course, muscle receptors and Golgi tendon organs. As a neurophysiologist I was particularly interested in how the authors treated the concepts of feedback and feedforward. While there is a brief discussion of corollary discharge, we are left to our own resources to appreciate how the organism benefits or adapts through feedback or presence of corollary discharge. Chapter 3 concludes with an elementary review of cortical control over hand motor function, with emphasis on the pyramidal tract. No supporting role is given to the basal ganglia or cerebellum. Chapters 4 and 5 cover tactile and active haptic sensing. These are two very strong chapters, owing again to the emphasis of the authors' own research area. The chapter on tactile sensitivity includes findings on

pressure, temperature, electrocutaneous, and vibration sensation. The authors present a four-channel model of mechanoreception based on psychophysical properties of the Pacinian end organs. This very handy table integrates findings from nearly a dozen studies. The second half of Chapter 4 focuses on spatial and temporal acuity and effects of various material properties (texture and geometry) on finger surface sensation. Chapter 5 deals with active haptic sensation. Evidence is presented to support the thesis that the haptic system is a form of multimodal perception that uses both tactile and kinesthetic inputs. The "active" part of haptic sensation implies a principal role of the motor system in this form of perception. This concept is certainly appreciated in Chapter 5, which integrates vast quantities of research in the areas of exploration, recognition, and weight discrimination.

In Chapters 6 through 8, attention is turned to motor functions, operationally classified into prehensile and non-prehensile skilled movements. As the authors stress throughout Chapter 6, prehensile movements such as pointing and grasping, rely heavily on the visuomotor system. This chapter includes classic neurophysiologic research on grip and load-force coordination. Extensive detail is given to the kinematic and kinetic properties associated with grasping various materials. Chapter 7 introduces the reader to the literature on skilled hand functions. The authors arbitrarily limit the categories of skilled movements discussed in this short chapter to gestures, pointing, aiming, keyboard skills, and bimanual music skills. Surprisingly, there is no mention of handwriting. I consider this missed opportunity puzzling, as handwriting constitutes one of the most highly learned skilled movements humans are capable of other than articulated speech. Society places much attention on developing intelligible handwriting and this skilled movement is one of the earliest signals of nervous system pathology. Chapter 8 extends the discussion on prehensile and skilled movements to consider the constraints imposed by altering surface contact, limiting deployment of

digits involved in movement, and introducing an intermediate link between the hand and the environment. The authors rely on a complex two-dimensional taxonomy derived from studies in the mid-1980s as a foundation for understanding the distinction between power and precision grasp; however there is no critical review of the advantages or limits of this scheme, how it has advanced our understanding of prehensile movement, nor alternative models. This chapter also includes research on bimanual movements and hand preference; however the authors missed another opportunity by not developing important evolutionary, maturational, and neural organizational aspects of handedness.

Chapter 9 focuses on hand function across the lifespan. This is perhaps the strongest chapter of the book. It is well organized, provides side-by-side comparisons of many hand functions across a wide range using tables and figures and covers topics that the reader is by now familiar with. As someone interested in motor programming, I was particularly impressed with the subsections on the Fitts' task. Chapter 10 is predominantly a review of assessment of sensory-

motor dysfunction of the hand with sections on sensory testing, functional tests, and ways in which persons with visual impairment can benefit from an environment that capitalizes on the hand's strengths at decoding tactile sensory input. The chapter concludes with a review of the literature on hand function and robotics, design of computer interfaces, and gaming.

The only substantive criticism I have with this book is that much of the supportive literature included throughout many chapters is somewhat old. This should not be confused to mean that the literature is outdated; in fact, quite the opposite. The authors should be commended for including the classic works in the field of hand function. In fact, one of the fundamental references cited throughout the chapters on sensory function is a textbook I used as an undergraduate 30 years ago. Still, some readers might be left wondering why research in this field seems to have tapered off in the last decade. In conclusion, *Human Hand Function* is an outstanding volume that will enhance any upper-level undergraduate or first year graduate course on hand psychophysiology.

## Cognitive Reserve: Where We've Been and Where We're Going

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*Cognitive Reserve: Theory and Applications*. Yaakov Stern (Ed.). 2007. New York: Taylor and Francis, 344 pp., \$99.00 (HB).

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Successful aging has been on my mind more and more these days. Time flows forward and I am now reasonably certain that I'm not getting any younger. Thankfully, cognitive reserve (CR) gives me a reason to be hopeful: although I never made it to the Boston Symphony Orchestra or the Olympic medals platform, perhaps all those French horn lessons and 6 AM swim-team practices will ultimately pay off.

Cognitive reserve has been a fertile heuristic for the past 20 years. CR explains the observed diversity of clinical expression across individuals with similar levels of underlying neuropathology. The history of the CR construct dates back to the observation of differential vulnerability to Alzheimer's disease pathology as a function of years of education (Katzman et al., 1988). Yaakov Stern stands out as the most articulate and productive thinker in the CR arena. Stern and his group at Columbia have pushed the CR concept forward and catalyzed a wide array of collateral investigations on everything from the genetics of CR factors to the influence of social activities on late-life cognitive function. *Cognitive Reserve: Theory and Applications* is an edited volume that provides a panoramic view of this field. The book updates and extends a 2003 special issue of the *Jour-*

*nal of Clinical and Experimental Neuropsychology*; six new chapters extend the scope of the original collection of 12 papers. The chapters take the reader on a wide-ranging tour of where the CR construct has traveled in the 20 years since Katzman's report.

Stern clearly articulates the structure of CR in the opening chapter, distinguishing between *brain reserve* and *cognitive reserve*. The former is viewed as a passive form and relates to physical aspects of the brain, such as size, neuronal count, and synaptic density. Cognitive reserve is construed as an active process, relating to information processing efficiency and capacity for compensatory function. Clearly, these two forms of reserve are interrelated. Stern describes two input streams that form the basis for CR: *neural reserve*, which entails utilization of more efficient or flexible neural networks, and *neural compensation* through which new brain networks are activated in response to disease or injury. CR applies to acute and gradually progressive disorders, as well as normal age-related change. Because of the experiential input to CR, it is dynamic and malleable and closely related to the concept of lifespan plasticity.

Although the chapters comprising *Cognitive Reserve: Theory and Applications* are not explicitly grouped, several