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and Stress*

Patterns of Physiological Response

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Cardiovascular Reactivity and Stress

Patterns of Physiological Response

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To my mother, Margaret

Foreword

This book is an articulate, concise, contemporary introduction to the study of important variables underlying cardiovascular reactivity. Its strength is in the combination of a scholarly but nonpedantic approach to cardiovascular psychophysiology and a solid understanding of behavioral medicine approaches to the study of hypertension. The topics covered are central to the study of relationships between behavior and cardiovascular reactivity; the list of suggested readings at the end of each chapter provides excellent guidance for more detailed study of specific issues.

It has now been more than a dozen years since Plenum Press published Paul Obrist's seminal monograph *Cardiovascular Psychophysiology*. The volume had a major impact in relating cardiovascular regulation to behaving individuals and in developing thoughtful hypotheses concerning such factors as they might pertain to hypertension. The impact of that work extended across scientific disciplines as well as across continents. At the time the Obrist book was published, a young psychologist, J. Rick Turner, was completing his Ph.D. thesis in psychology at the University of Birmingham, England, on heart rate reactions to psychological challenge. After continued collaboration for the next several years with his former Ph.D. mentor, Douglas Carroll, Turner joined the Obrist laboratory at the University of North Carolina. Although Obrist unfortunately died during Turner's tenure in the laboratory, collaboration continued with Kathleen Light and Andrew Sherwood. The enlightened legacy of the North Carolina laboratory can clearly be seen in this text.

A central hypothesis discussed in the volume is that cardiovascular reactivity may be a risk factor for essential hypertension. Turner carefully points out that the potential link between elevated cardiovascular reactivity and cardiovascular disease may occur either as a marker of risk or as a causal mechanism. In either case it would be important from the standpoint of predicting later disease. As a trained methodologist, however, Turner emphasizes that the extent to which cardiovascular reactivity can be considered as a risk factor in part involves demonstrating that it provides a stable measure of individual differences. In a well-balanced, thoughtful review of this issue, Turner describes strong evidence of temporal stability for cardiovascular reactivity and discusses important issues concerning intertask consistency and laboratory-to-field generalization.

The major strengths of the book are in providing a balanced evaluation of the phenomenon of cardiovascular reactivity and in offering valuable insights into its potential links with hypertension. Although biomedical scientists primarily interested in hypertension might wish to know more about how reactivity is linked to distribution of the blood flow in low-flow circulatory states, the role of central nervous system drive in the regulation of pressure or flow, sensitization of receptors by sodium, possible subcategories of essential hypertension, or the role of insulin metabolism in sympathetic nervous system activity and sodium retention, Turner wisely restricts his discussion to those issues in which behavioral medicine research has facilitated an understanding of cardiovascular reactivity. The discussions in the present volume concerning age, ethnicity, gender, personality, and renal factors as contributors to individual differences in reactivity are valuable. So too is the fascinating chapter on genetic determinants of individual differences in reactivity.

In summary, this text provides a valuable introduction to the study of cardiovascular reactivity and its importance in behavioral medicine research. The evidence that cardiovascular reactivity may be a risk factor for cardiovascular disease is provocative and potentially important. This book is written at a level that should permit behavioral scientists without extensive biomedical training to understand in detail the role that cardiovascular reactivity may play as a risk factor for cardiovascular disease. Conversely, it is sufficiently scholarly and well-written to provide critical insights to biomedical scientists who may be intrigued by potential relationships between behavior and

cardiovascular disease. It is certainly a timely, important, and valuable book.

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Preface

Cardiovascular reactivity refers to changes in cardiovascular activity associated primarily with exposure to psychological stress. The investigation of reactivity is of considerable interest to scientists from the disciplines of psychology, psychosomatic medicine, and behavioral medicine. Psychologists are particularly interested in it because different individuals show different amounts of reactivity under the same conditions. This individual variation has led reactivity to be regarded as an individual difference dimension, and all individual difference phenomena are of interest to psychologists. However, reactivity has also attracted additional experimental attention because of hypothesized links between sizable stress responses and the later development of cardiovascular disease. Researchers from the fields of psychosomatic and behavioral medicine have therefore extensively investigated the characteristics of reactivity. This volume introduces and discusses some of the experiments that have examined these characteristics and places them within a behavioral medicine/psychosomatic medicine framework.

Behavioral medicine and psychosomatic medicine are interdisciplinary fields that investigate the role of behavior in the development of disease. They are concerned with mechanisms of behavioral influence, prevention, detection, treatment, and rehabilitation. Medical doctors, psychologists, health educators, and many other health professionals work together to use behavioral science in these pursuits. Cardiovascular behavioral medicine is the subdiscipline of behavioral medicine that focuses on behavioral influences in cardiovascular disorders. In this volume we shall concentrate on one particular disorder—hypertension.

Hypertension, or high blood pressure, is an extremely prevalent disease in industrialized societies. It is also of added significance because it is a potent risk factor for coronary heart disease, which is responsible for more adult deaths in Western countries than any other single cause.

The following chapters investigate the occurrence and nature of cardiovascular reactivity and describe the relationships among stress, reactivity, and potential disease outcomes. The text is divided into three parts. The first part provides an introduction to the cardiovascular system, its control by the nervous system, and the laboratory elicitation and assessment of reactivity. Potential links between large cardiovascular stress responses and the later development of hypertension are also discussed. The second part describes laboratory experiments designed to explore both individual and group differences in reactivity. The relationship between cardiovascular activity during stress and concurrent metabolic needs is explored, and the influence of genetic inheritance is investigated. Finally, the third part starts with an overview of studies that have explored cardiovascular activity during naturally occurring stressful situations encountered during everyday activities. Although laboratory investigation of reactivity is extremely useful because of the tight experimental control that is possible, investigation of stress responses during natural circumstances is crucial. If reactivity does play a role in the development of cardiovascular disease, it is in the presence of everyday stressors that these reactions will take their toll. The penultimate chapter explores the topic of risk determination, and it considers whether it might be possible to develop an information-gathering protocol that will enable the identification of young people at risk for the later development of cardiovascular disease. If this can be done successfully, the final chapter observes, intervention strategies become a possibility. Detailed discussion of such strategies is beyond the focus of this volume, but references are provided to point the reader in appropriate directions.

While writing this volume, I have tried to keep two categories of potential readers in mind. Various aspects of the text's organization will, I hope, make the contents accessible and informative to each type of reader. First, for the reader who is simply interested in learning something about reactivity, I have tried to provide a self-contained introduction to the topic. Reading the chapters sequentially should provide some idea of what reactivity research is about without necessitating referral to other sources. Second, for students who wish to become more thoroughly acquainted with the topic, lists of further readings are

provided at the end of each chapter. These readings, along with the references at the end of the volume, should provide starting points for further study. The readings can be pursued by individual students or by members of a class. Small groups of students may wish to study one reading each and report back to the class as a whole; discussions of this material may prove particularly helpful.

Of course, only the reader can evaluate whether I have achieved my goals. I should be pleased to receive feedback on any aspect of how the volume might be improved. I can be contacted at the Division of Pediatric Cardiology, Department of Pediatrics, College of Medicine, University of Tennessee, Memphis, 777 Washington Avenue, Suite 215, Memphis, TN 38105.

Many people have provided personal and professional support that contributed to the completion of this project. Thanks are expressed to Robert Brown, Michael Byng, Douglas Carroll, Raymond Cochrane, David and Ian Crowley, Barbara Dodd, Clive Eastman, John Hewitt, Lisa Jack, Roy Jeans, Donna Lang, Lynn Liben, Kathleen Light, Lia Marini, Robert Mears, Graham Millard, Nancy Norvell, David Ragland, Robert Stern, Julian Thayer, and Marcia Ward. Thanks also to Gary Swan of SRI International, who allowed me to access SRI's Health Sciences library facilities, and to many authors who sent me reprints and preprints. While many authors have written eloquently on the topic of reactivity, I have found particular inspiration in the work of Stephen Manuck and the late Paul Obrist.

Eliot Werner at Plenum, at whose invitation this project was undertaken, and series editor William Ray provided essential help throughout all stages of the book's development. Much needed feedback on earlier drafts was given by John Hewitt, Kathleen Light, William Lovallo, James McCubbin, and Andrew Sherwood. While it is almost unfair to single out one of these readers, I should like to acknowledge that Bill Lovallo provided extensive and detailed advice concerning the content and structure of two chapters I found particularly hard to write; special thanks are accordingly expressed to him.

The original manuscript was prepared by Dot Faulkner, Donna Taylor, and Pat Taylor; thanks are expressed to them, and to Jocelyn Sharlet and Dan Kulkosky at Plenum for production of the published volume.

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Finally, I thank my friend and colleague Andrew Sherwood for his immeasurable help during the past ten years. He has shared his ideas and expertise generously and selflessly, and his scholarly insights have profoundly influenced my thinking. I have no doubt that without his help, I could not have written this book.

J. RICK TURNER

Memphis, Tennessee

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