

# **Behavioral Medicine:**

**Theory and Practice**

Edited By  
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and  
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# Medicine: Practice

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# Behavioral Theory and

# Preface

This volume represents an attempt to define behavioral medicine by reviewing the methodology and technology on which it is based and by presenting representative applications.

At present there is no source book that provides—within one cover—a systematic and comprehensive discussion of the historical, methodological, experimental, and clinical issues that face this burgeoning new field. Reviews on biofeedback (Birk, 1973), psychosomatic medicine (Lipowski, 1977), self-management (Mahoney and Thoresen, 1974), weight control (Stunkard, 1975), and preventive medicine (Pomerleau, Bass, and Crown, 1975) have been helpful, but because they have been directed to specialized audiences, the general implications of the approach have yet to be communicated to the many scientists and physicians whose qualifications and interests make them likely contributors to research and practice in behavioral medicine. A number of excellent books have dealt with behavioral medicine indirectly as part of a general survey of behavior therapy (Leitenberg, 1976), or directly in a compendium of reprinted articles (Katz and Zlutnick, 1975) or published papers from a conference (Williams and Gentry, 1977). In contrast, the present volume is an integrated text with original critical evaluations by leading clinicians and researchers which treats both basic concepts and clinical applications.

Given the recent rapid development of the field, there is a need for a well-elaborated introduction to behavioral medicine—one which allows the medical practitioner to grasp the potential benefits of the scientific analysis of behavior and which also allows the behavioral scientist to recognize the medical significance of various health habits. We hope that *Behavioral Medicine: Theory and Practice* will serve as a stimulus for increased interaction and collaboration between professionals with service orientation—physicians, nurses, clinical psychologists, specialists in preventive medicine and public health—and basic scientists and methodologists—epidemiologists, experimental psychologists, and physiologists.

The book is divided into two main sections: basic concepts and clinical applications. In the basic concepts section (chapters 1–4), research findings in behavioral epidemiology, learning and conditioning, biofeedback, and self-management are presented. The techniques and methods which characterize the field are given, along with examples relating to applications described in later chapters and suggestions for further research. For the non-specialist, extensive bibliographies facilitate access to the various disciplines represented; for the specialist, critical reviews of current contributions to the field are provided to improve and to stimulate basic research.

In the clinical sections (chapters 5–12), representative applications are described and discussed. Where appropriate, relevant medical or physiological background is presented in the context of reviewing etiology, assessment, treatment, and outcome for the particular problem. Sufficient detail is given to illustrate clinical principles, pointing out various therapeutic and experimental difficulties as well as suggesting directions for future inquiry. As in the methodology section, the needs of both the specialist and non-specialist are taken into account.

The rationale for the order of chapters is as follows. Epidemiology was chosen as the first chapter because, historically and conceptually, observations concerning relationships between behavior and disease have preceded behavioral intervention on medical prob-

lems. A discussion of learning and conditioning concepts follows, because the experimental analysis of behavior—more than any other discipline—has made possible the active-intervention technology which characterizes behavioral medicine. The section on basic concepts is completed by chapters on biofeedback and self-management—the two principal forms of intervention in clinical behavioral medicine. The section on applications begins with chapters which emphasize exteroceptive control and direct manipulation of the environment by the therapist, of which behavioral pediatrics and the management of chronic pain provide excellent examples. The section ends with chapters in which self-management procedures predominate—techniques in which the patient or client modifies his or her own environment to engender more adaptive behavior, as illustrated by the chapters on smoking, problem drinking, and obesity. The middle chapters—musculoskeletal disorders, sexual dysfunction, and hypertension—are characterized by a mixture of direct and indirect environmental modification techniques.

There are numerous interrelationships among the sections and various topics. Thus, epidemiological findings have contributed to interest in dietary management, hypertension, smoking, and problem drinking. As has been mentioned, learning and conditioning concepts apply to all topics presented. Biofeedback methods have played an important role in the treatment of musculoskeletal disorders and hypertension as well as the management of chronic pain, whereas self-management principles have been used extensively in obesity, smoking, and problem drinking. Compliance, as a general theme, is emphasized in the chapters on chronic pain, obesity, hypertension, smoking, problem drinking, and behavioral pediatrics, while prevention of disease is an important consideration in the chapters on dietary management, hypertension, smoking, and problem drinking. Finally, while the clinical chapters clearly represent the interests of psychiatry, family medicine, and internal medicine, the volume as a whole may be regarded broadly as the application of psychology to problems in medicine.

We have attempted to obtain more than the usual degree of integration in an edited book. Each contributor was sent a preliminary draft of the introduction, and the information in the introduction was taken into account by the authors before writing each chapter. The authors then modified the introduction to reflect their opinions as to the scope and promise of behavioral medicine and then returned the revision to the editors. The resulting introductory section is thus an expression of the editors' view of behavioral medicine influenced by the authors' added perceptions.

The authors for the present volume are basic researchers and clinical investigators who have gained recognition for their contributions to behavioral medicine. In most cases, they have written major reviews of their area for a more specialized context. Since it is clearly impossible to present all the topics which come under the rubric of behavioral medicine, we have arbitrarily limited selection to those areas which have important clinical and research implications and which are sufficiently well developed to be subjected to stringent critical evaluation. The existence of an articulate spokesperson for a given area also influenced our choices. We do not claim that the list of topics is exhaustive, but rather offer it as a preview of future developments.

The present volume represents interests in the Department of Psychiatry of the University of Pennsylvania that go back nearly a decade, beginning with research on obesity by Albert J. Stunkard. Nearly six years ago, we began to extend some of the innovative techniques used in weight control to smoking cessation and problem drinking. This led to a conceptual shift, from disorders of self-control to disorders of self-management, a change which emphasized a more general context for treatment—namely, *prevention* of disease through risk-factor modification and *adherence* to treatment through contingency management. Accordingly, in 1973, a new clinical unit—the first of its kind—was formally organized and took the name, "Center for Behavioral Medicine." Since that time, our colleagues have introduced relaxation procedures, biofeedback, health evaluation, and several new clinical areas to the original Center activities. It is with gratitude that we acknowledge the help and assistance provided by our various

colleagues at the University and by the staff of the Center in this promising venture called behavioral medicine.

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# Introduction: The Scope and Promise of Behavioral Medicine

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### **What is Behavioral Medicine?**

The term "behavioral medicine" is being used with increasing frequency to describe certain kinds of intervention and research in psychophysiological and medical problems. Behavioral medicine is still in the process of evolving conceptually and, although any definition promulgated at present must be seen as tentative, a working definition should be attempted as this volume's first order of business.

Although interest in the interactions between behavior and disease is as old as the practice of medicine, systematic behavioral medicine is a relatively recent development. A brief discussion of the relationship between behavioral medicine and related areas may be helpful in understanding the approach.

Psychosomatic medicine, for example, is concerned with the interplay between psychosocial and physiological variables in disease, although it constitutes a broad area of interest rather than a particular methodo-

logical approach. In its most recent forms, it has been seen as comprising a "biopsychosocial" model which encompasses all health and disease (Weiner, 1977). Historically, the field has drawn heavily from the psychoanalytic theories of Freud and Alexander and, more recently, has been characterized by considerable psychophysiological research in medical and psychiatric contexts; the emphasis has been primarily on etiology and the pathogenesis of physical disease (Schwartz and Weiss, 1977). Medical psychology has been employed to describe the use of psychological principles and techniques in the diagnosis and assessment of physical illness and the use of certain research strategies in the evaluation of treatment. The term medical psychology also refers to a broad field of activity, one in which psychometric assessment, projective testing, and personality theory have played major roles. The emphasis in medical psychology has been on the understanding of medical illness in its psychological and social context rather than on therapy.

Behavior modification and behavior therapy are more specific terms, conveying a particular type of intervention as well as a strategy for diagnosis and a specific research methodology. Behavior modification has used experimentally derived principles of learning and conditioning in a wide variety of situations to modify maladaptive behavior or to inculcate more adaptive patterns (e.g., Risley and Baer, 1973). While the procedures for intervention are clearly delineated, the term behavior modification does not limit applications to any particular area—although historically, it has been associated with behavior change in educational and rehabilitative settings. Similarly, behavior therapy indicates a method of treatment. While its clinical purpose corresponds more closely to behavioral medicine, in that it implies a contractual agreement between therapist and patient or client to modify or treat a designated problem behavior (e.g., Wolpe, 1969), historically, behavior therapy has remained the province of the clinical psychologist and psychiatrist, being concerned less with physical disease and more with neurosis and affective disorders.

Behavioral medicine as a clinical activity is an outgrowth of behavior modification and therapy, borrowing procedures and techniques as well as assessment and research strategies. While some definitions have been attempted, not all have emphasized its origins in modern behaviorism (Skinner, 1953). For example, Schwartz and Weiss (1977) have characterized behavioral medicine as the “field concerned with the development of behavioral-science knowledge and techniques relevant to the understanding of physical health and illness and its application . . . to prevention, diagnosis, treatment, and rehabilitation.” The definition is useful because it specifies a sphere of interest, delineates problem areas, and designates both research and clinical activity as relevant. A major drawback to the definition, however, is the implication that behavioral medicine owes its existence equally to the variety of specialties and disciplines subsumed under the term “behavioral sciences”: It thus becomes an amalgam of elements from personality theory, medical sociology, and cultural anthropology, as well as an application of social learning theory to the health field. While

there have been numerous important contributions from the social as well as the biological sciences—particularly epidemiology and physiology—these and related disciplines have constituted a *necessary but not sufficient* condition for the development of behavioral medicine (Pomerleau, 1978).

This issue was anticipated clearly by Agras (1975) in his introduction to *Behavior therapy and health care*:

The fact that behavior affects both disease and the maintenance of health has long been known, and for just as long has been minimized or overlooked both by medical research workers and clinicians. One reason for this minimization of the importance of behavior and even the behavioral sciences in medicine has been the lack of procedures derived from these sciences which change behavior in a clinically useful way. The development of behavior therapy has begun to alter this undesirable state of affairs. First, by introducing innovative and effective treatment procedures, and second, by acting as a vehicle for the application of the research methods and findings of experimental psychology to the health field (p. xi).\*

We propose that the initial definition of behavioral medicine give adequate emphasis to the experimental analysis of behavior, as the inspiration and the source for much of the current activity. We recognize that the delimitation of a new field poses a special challenge—if the initial definition is too narrow, future activity may be misguided or stifled; if it is too broad, there may be insufficient identity to stimulate directed movement. Therefore, we suggest the following definition as a compromise:

*Behavioral medicine* can be defined as (a) the clinical use of techniques derived from the experimental analysis of behavior—behavior therapy and behavior modification—for the evaluation, prevention, management, or treatment of physical disease or physiological dysfunction; and (b) the conduct of research contributing to the functional analysis and understanding of behavior associated with medical disorders and problems in health care.

Ultimately, a field is defined by what it does; if conditions change, then the definition of behavioral medicine should be modified accordingly.

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## Basic Concepts

Behavioral medicine as a technology is an outgrowth of developments in certain basic sciences. The contribution of the descriptive sciences to behavioral medicine is illustrated by work in epidemiology and the contribution of the experimental sciences, by psychology.

*Epidemiology.* Epidemiology can be defined as the study of health and disease of populations and of groups in relation to their environment and ways of living. While the clinician usually deals with individual cases, the epidemiologist is concerned with cases as they occur in the population. An example of the kind of inferences that have been drawn from epidemiological research is provided by statistics on mortality from all causes, for middle-aged men and women in England and Wales, as described by Morris (1957). From the turn of the century to the 1920's, death rates for both sexes began to fall in response to sanitary reform. From the 1920's to the 1950's, however, female mortality kept its downward course, but males failed to show a corresponding decrease. Males show a decrease in death rate during this time only when pulmonary cancer and coronary heart disease are partitioned out of the samples. This suggests that, for men, improvements in mortality from prophylaxis and more effective treatment of infectious diseases were offset by the increasing incidence of certain chronic degenerative diseases. This general observation has been replicated with various populations in Western industrial nations over the years (Pomerleau, Bass, and Crown, 1975).

Both retrospective and prospective studies are representative of the epidemiological method. Retrospective observation has the advantage of focusing on the phenomenon of interest (e.g., the onset of a given disease or condition) after it occurs, in an attempt to determine contributory variables. However, there is often great difficulty in ascertaining all of the key events which lead to disease after the fact. For this reason, prospective, longitudinal methodologies are receiving increased attention. Among their particular advantages is that information can be obtained in a similar fashion for both future cases and their controls, thus reducing potential sources of bias or error.

The incidence and circumstances of new cases can be obtained more accurately, which is important in conditions like coronary heart disease where sudden death is the first clinical manifestation for a substantial percentage of cases. Moreover, the forward-looking study may be the only way to investigate the natural history of a complex disease process.

Epidemiological research has played an important role in demonstrating the relationships between certain behavioral variables and morbidity and mortality. The correlational relationships have provided pre-morbid predictors for certain disease states and have, of late, resulted in useful recommendations for the prevention and management of chronic degenerative diseases. For example, the Framingham Study (Kannel, Castelli, and McNamara, 1968) showed how the presence of certain patterns of behavior such as cigarette smoking was associated with increased incidence of coronary heart disease. Thus, cigarette smoking and its pathophysiological sequelae constitute a risk factor for heart disease. Other demonstrated or suggested risk factors for heart disease are obesity, hyperlipidemia, lack of exercise, type A behavior pattern, hypertension, diabetes, and family history of heart disease. It is interesting to note that behavior or behavioral management is involved in the modification of each of these risk factors—even family history can be seen as having a behavioral component, for it reflects in part, traditions and preferences which increase risk.

The correlational relationships carry certain implications. If cigarette smoking, in the above example, is associated with increased risk of heart disease, then quitting smoking is likely to decrease the probability of such disease. Studies of morbidity and mortality in former smokers bear this out (Hammond, 1962). What has not been done in any systematic way, however, is to test whether former smokers assume a lower risk as a result of quitting or if their "spontaneous" quitting reflects a common variable which also puts them at decreased risk. The best way to study this relationship is to treat current smokers and to compare the incidence of smoking-related diseases in those who quit and those who do not quit. Beyond the time and expense involved in conducting such a study, the chief limit-

ing factor has been the lack of potent intervention techniques. Promising trends in behavioral smoking cessation treatment, however, may resolve this difficulty.

Just as epidemiology has provided basic observations which make possible risk-factor modification in the prevention of heart disease, descriptive methodology from other sciences has contributed in like fashion to the understanding of various medical conditions and disorders. For example, Kinsey, Pomeroy, and Martin (1948, 1953) studied normal sexual behavior and frequency and severity of sexual disorders, and Masters and Johnson (1966) studied the physiology of the sexual response. Similarly, cross-cultural studies of pain, longitudinal studies on the course of essential hypertension, and prospective studies of pre-morbid characteristics of alcoholics have all influenced treatment practice.

*Psychology.* Experimentation on learning and conditioning provides the foundation for treatment in behavioral medicine. The development of a technology for modifying maladaptive behavior effectively is relatively new, representing an extension of basic research on animal learning by Pavlov (1927) and Skinner (1938) to problems in human behavior. Learning and conditioning approaches are referred to as "behavioral" in keeping with the emphasis on relating measurable activity (behavioral responses) to antecedent and subsequent environmental events (stimuli).

Two of the concepts growing out of this approach—contingency management and stimulus control—have been particularly useful. Contingency management is based on the experimental observation that consequences of behavior (reinforcing stimuli) determine the pattern of subsequent behavior; thus, a reinforcer is a behavioral consequence that has the effect of making the behavior that preceded it or produced it more likely to be repeated (Rachlin, 1970). A reward such as praise or money given for a designated behavior is an example of a reinforcer. Frequently employed consequences which increase the frequency of behavior are presentation of reward (positive reinforcement) and interruption of aversive stimulation (negative reinforcement); consequences which decrease the frequency of behavior are interruption of rewarded activity (time out) and presenta-

tion of aversive stimulation (punishment). Thus, a major aspect of behavior modification is the deliberate scheduling of response-contingencies to increase adaptive behavior and to decrease maladaptive behavior.

A second important concept is stimulus control, which refers to the influence of environmental events (including stimuli both internal and external to the organism) in providing the context for on-going behavior (Terrace, 1966). A stimulus can affect behavior because it has been associated with a reinforcer (e.g., respondent conditioning) or because the stimulus signals a situation in which the behavior has been associated with a reinforcer (e.g., operant conditioning). A stimulus control analysis is used in many behavioral applications to specify how the environment determines the problem behavior. Typically, a detailed analysis is carried out on the target behavior and on the social and physical events within the environment which are temporally related to the behavior. Behavioral management is then sought through manipulation of these environmental stimuli. A stimulus control analysis can thus be seen to serve a similar function to traditional clinical assessment.

Shaping and modeling represent techniques which are also frequently utilized in behavioral treatment (Bandura, 1969). When a desired behavior does not occur, or occurs with an extremely low frequency, the behavior most closely approximating the desired terminal behavior is selected for reinforcement. Then, reinforcement is made contingent upon successively closer approximations to the desired behavior, thus "shaping" the response gradually in the new direction. Modeling is a technique for modifying behavior through observation and imitation. Typically, the model emits the desired behavior and the subject is rewarded for imitating or approximating it.

## Representative Interventions

*Biofeedback.* Biofeedback, an important tool for understanding and treating psychophysiological disorders, may be regarded as a special application of operant-reinforcement procedures. Traditionally, the shaping of behavior by arranging its consequences has been thought to apply to "voluntary" responses, i.e., skeletal-muscle be-

havior. The key notion in biofeedback is that operant-reinforcement techniques may also be used to modify responses which are traditionally regarded as "involuntary," i.e., responses of smooth muscles and glands.

Miller (1969) and his colleagues and, more recently, investigators such as Thornton and Van Toller (1973) and Gliner, Horvath, and Wolpe (1975) have demonstrated that animals can learn to modify autonomic physiological responses in highly specific ways if immediate, rewarding consequences are provided for small incremental changes. In the earliest experiments, the animals were paralyzed with curare in an attempt to ensure that the organism's learned control of heart rate, blood pressure, or other physiological variables was not simply a matter of inducing a change indirectly by means of skeletal-muscle responses. Typically, avoidance of aversive shock or the direct stimulation of positive reinforcement centers in the brain were used as reinforcers. Even more convincing demonstrations have been carried out with human subjects who have been taught to alter physiological variables in highly specific ways not generally regarded as being under voluntary control (e.g., Shapiro, 1977; Taub and Emurian, 1976). In human experiments, feedback is usually provided by transforming the physiological variables of interest into electrical signals which are then used to control visual or auditory stimuli, thereby providing information to the subject on his or her own physiological state. Changing the physiological variable in the desired direction is usually sufficient reinforcement, although other consequences, such as monetary rewards, can be attached to successful learning. An important characteristic of the approach is that, with appropriate transducers, it is possible to add the specificity and discriminability of exteroceptive stimulation (such as light and sound) to less well-defined information provided by the usual interoceptive cues (proprioception, kinesthesia, etc.).

The elegance of these experimental demonstrations notwithstanding, the capability of human beings to gain control over physiological variables has been known in other contexts for a long time. The celebrated Indian Yoga is an example of a person who has learned to control many physiological

variables by techniques which may be similar. A very dramatic demonstration of learned control over certain physiological variables, presumably without the mediation of skeletal-muscle responses, was provided by Lapidès, Sweet, and Lewis (1957). After administering curare and related drugs to eliminate skeletal-muscle responses in 16 volunteer subjects, Lapidès et al. demonstrated that normal adults were still able to initiate and terminate micturition on request. The experiment was performed to demonstrate that, in keeping with anatomical studies, only smooth muscles are essential for micturition, but also, in the normal course of development, humans learn to control voluntarily a complex series of smooth-muscle responses.

In addition to its theoretical implications, biofeedback is of interest as a method of treatment and as a tool for the study of pathophysiological mechanisms. However, as is often the case with a new mode of treatment, the number of disorders for which biofeedback has been shown to be specific and clinically useful is fewer than some uncritical and overly enthusiastic reports would suggest. Well designed, controlled studies are needed with extended follow-up to demonstrate that the beneficial changes produced by biofeedback are not the result of suggestion or other non-specific factors and that they generalize to the natural environment, are of sufficient magnitude to be clinically useful, and persist for a significant period of time to represent a therapeutic advance. The potential of these methods for the treatment of medical disorders is discussed in the chapters on biofeedback, musculoskeletal disorders, and hypertension.

Of equal promise is the use of biofeedback techniques as an investigational tool. An example of this use is provided by Weiss (1977) in his studies on the treatment of premature ventricular contractions and other cardiac arrhythmias using heart rate biofeedback training. By blocking specific neuromechanisms in the regulation of heart rate using pharmacological agents such as atropine and propranolol, Weiss has identified some of the mechanisms involved in learned heart rate alterations.

*Self-management.* The recent emergence of specialized behavioral techniques for enhancing self-control and self-management

(Mahoney and Thoresen, 1974) has important implications for the application of behavioral principles to medical problems. In much of the earlier work on behavior modification, change was brought about directly through environmental manipulations that modified the behavior of the person with the problem. With self-management procedures, however, the therapist teaches the person with the problem to change aspects of his or her environment which in turn modify the problem behavior. Thus, with self-management methods, the passive role of patient is transformed into the active one of participant; the role of the therapist becomes one of devising effective behavior change techniques and of motivating participants to carry them out. (The degree to which self-management versus clinician-controlled intervention is used varies widely, as can be seen in the various clinical application chapters.)

As discussed by Pomerleau et al. (1975), using an alarm clock to wake up in the morning is an example of a simple, but effective self-management strategy:

The strategy is based on the observation that before the subject goes to sleep the night before, the reinforcing value of getting up on time in the morning is greater than that of sleeping late, whereas the next morning the values reverse (Rachlin and Green, 1972). Setting an alarm clock thus serves as a commitment strategy to enhance adaptive patterns of behavior—in this case rising early—that maximize certain long-range positive consequences such as arriving at work on time. In like manner, strategies can be devised to modify maladaptive habits so as to minimize long-range negative consequences; for example, self-control tactics may be used to increase control over drinking behavior, thereby avoiding alcoholism as an ultimate aversive consequence. Self-control procedures in which people change their own behavior to achieve certain long-range advantages seem more likely to succeed than those that attempt to modify behavior by simply trying to control or remove misused substances from the environment, as is demonstrated by the lack of success in legislating self-control by raising the price of cigarettes through taxation (Bernstein, 1969) or by prohibiting the sale of alcoholic beverages (p. 1278).†

While derived from learning and conditioning concepts and sharing many techniques and strategies with traditional behavior modification and therapy, behavioral self-management has several characteristics which set it apart. Before examining them, however, it is useful to distinguish between self-control or self-management and willpower. Although sometimes used synonymously, willpower refers to a hypothetical inner force which purports to account for self-regulatory behavior. Thus, as Mahoney and Thoresen (1974) point out, if a heavy smoker quits “cold turkey,” he is sometimes described as having willpower. How do we know he has willpower?—because he quite smoking. In addition to being a tautology which provides no real information beyond a rephrasing of the original behavioral observation, willpower has the additional disadvantage of discouraging further inquiries into the controlling conditions for the behavior.

Self-management techniques come under three main headings: observation, modification of environmental variables, and alteration of behavioral consequences. A knowledge of controlling variables is crucial to successful behavior change. Typically, this is accomplished by having the subject record his or her behavior and the conditions under which it occurs. Thus, the smoker trying to quit can record each day the time, the place, the social circumstances as well as mood, cigarette-by-cigarette (Pomerleau, Adkins, and Pertschuk, 1978). The individual who self-monitors behavior becomes more aware of his or her own actions and receives immediate feedback on the status of the problem behavior. In addition, specific information (stimulus control analysis) concerning the variables controlling the problem behavior is provided for the therapist. An example is smoking after each meal, or being with a certain friend, or feeling tense socially. While self-monitoring is usually not sufficient in itself to change maladaptive behavior completely, it does constitute a first and critical step toward successful self-management.

As in standard behavior modification or therapy, self-management techniques are concerned with changing those antecedent

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stimuli which set the occasion for maladaptive behavior. A key difference is that the participant or client rather than the therapist changes the controlling environment. In weight control programs, for example, participants are told not to stockpile fattening foods—"If it isn't there, you can't eat it." In the reduction phase of smoking programs, participants are asked to carry only the exact number of cigarettes authorized in their daily quota. Restricting prepotent environmental variables constitutes an important second step toward effective self-management.

The third step involves altering the consequences of behavior—contingency management. Again, the participant or client provides the actual modification, with suggestions provided by the therapist. Thus, the person trying to lose weight might persuade a few friends to form a jogging group, thus obtaining social reinforcement for exercising. The smoker alters reinforcement contingencies for smoking by increasing the intervals between craving and lighting up, thus weakening the habit. Finally, contracts involving money can serve as useful tools by setting up a schedule of extrinsic reinforcement: For example, in a program for problem drinking (Pomerleau, Pertschuk, Adkins, et al., 1978), a prepaid "commitment fee" of up to \$300 can be earned back contingent on keeping daily records of drinking or craving, on attending treatment sessions without detectable breath alcohol, on carrying out designated monitored non-drinking activities, and on attending follow-up sessions; the money is forfeited if the participant drops out of treatment.

Obesity, smoking, and problem drinking are examples of common self-management disorders. Although each disorder has its own clinical tradition, the behavioral approach makes it possible to place them in a common conceptual framework. Since the behavioral treatment of obesity has a well documented record of effectiveness, this disorder will be used as an example.

The work of Ferster, Hurnberger, and Levitt (1962) has been most influential among the early attempts to treat obesity with behavioral methods. The developments that grew out of their work included stimulus control analysis, specification and

disruption of reinforcers for overeating, and the identification of the "ultimate aversive consequences" of overeating to provide a rationale and motivation for attempting behavior change. Subsequently, Stuart (1967) adopted Ferster's approach for use in a small group setting. Among his innovations was a stimulus control analysis based on a written record of daily eating behavior and assessment of progress by monitoring weight gained or lost on a weekly basis; in addition, total caloric intake was reduced by limiting the number of situations in which eating was authorized (e.g., eating in only one location and engaging in no other activities during eating) and by developing new techniques to enhance behavioral control (e.g., shopping for food after a meal rather than before). One year after the end of treatment in an initial group of 10, Stuart's procedure had resulted in weight losses of more than 18 kg (each) in three participants and more than 14 kg in six others. The work was extended to additional groups, with comparable success (Stuart and Davis, 1971). These findings have since been replicated by Stunkard and his co-workers (Penick, Filion, Fox, et al., 1971; Stunkard, 1972), and the general method has been shown to be more effective than non-behavioral approaches (Stunkard, 1975).

Among the current trends in self-management research is a shift in emphasis from short-term intervention to long-term maintenance. The chapters on smoking, problem drinking, and obesity take up the issue at some length. Another, particularly promising development is the possibility that research on underlying mechanisms may eventually generate a truly rational therapy for some of the more common self-management disorders. The potential of the approach is discussed in recent reviews of psychobiological research on obesity (Rodin, 1978) and smoking (Pomerleau, 1979).

### Major Themes in Current Practice

There are four principal lines of development in behavioral medicine at present. The first involves intervention to modify a behavior which in itself constitutes a problem. Examples are behavior modification with children, self-management training,

behavior therapy for sexual disorders, or biofeedback for a psychophysiological disorder that is not part of another disease process. As numerous illustrations are provided throughout the book, this area will not be discussed further here.

In a second area of development, the focus of intervention is on the behavior of a health-care provider, in order to improve delivery of service to a patient or client. Although less work has been done, the area shows much promise for the future (e.g., Berni and Fordyce, 1973). A study by Pomerleau, Bobrove, and Smith (1973) on psychiatric aides illustrates the general approach. The behavior of aides was considered a limiting factor in the treatment of highly disruptive state hospital psychotics. Baseline observations showed that aides typically ignored their patients unless they caused trouble. Special contingencies of reinforcement were introduced to increase the number and quality of therapeutic interactions between aides and patients—in particular to encourage attention for more appropriate social behavior by patients. Under the “aide incentive plan,” a small number of patients was (randomly) assigned to each aide. In a given week, the aide’s performance was ranked by comparing the comportment of his or her assigned patients (rated on a standardized scale, the *Ward Behavior Inventory*). The aide whose patients improved more than those of the other aides was designated “aide of the week” and received attention and praise. In various conditions, the “aide of the week” received no award, or \$10, \$20, or \$30 awards. The amount of disruptive or inappropriate behavior by patients on the ward as a whole was found to decrease in direct proportion to the amount of monetary incentive given to the aide of the week. Performance feedback and contingent choice of days off have also been shown to produce beneficial effects on staff behavior in institutional settings (Quilitch, 1975; Iwata, Bailey, Brown, et al., 1976).

Similar work has been carried out on medical wards. In research which is particularly timely, several investigators have studied overutilization of laboratory tests (redundant or unnecessary tests). Dixon and Laszlo (1974) limited house officers to eight tests per inpatient per day and re-

ported decreased use of the laboratory by 25%, while increasing the clinical utility of the average test. Griner and Liptzin (1971) showed that laboratory utilization at a teaching hospital remained constant rather than continuing to increase, after guidelines were issued on the proper use of the laboratory. Eisenberg, Williams, Garner, et al. (1977) developed a computer-based medical audit to screen out patients who received unnecessary laboratory tests and provided feedback to the responsible physician; they found that mean weekly use of designated tests decreased during the feedback condition compared with baseline. Systematic research on this and related problems has great potential for making medical care more cost-effective.

A third area of development is concerned with the use of behavioral techniques to improve the patient’s adherence to the treatment regimen. The behavior to be modified is important to the extent that it limits the effectiveness of treatment, whether medical or behavioral. Patient compliance has been a particularly frustrating and difficult problem in medical practice, as case histories in the treatment of diabetes, hypertension, chronic pain, and physical rehabilitation illustrate dramatically. Because the problem constitutes a major theme which recurs in several of the clinical chapters in the present volume, adherence to the therapeutic regimen will be reviewed in some detail below in a separate section.

The fourth line of inquiry has to do with prevention of disease. Here, the behavior to be changed is important because it leads to or exacerbates a medical condition or disease. Coronary artery disease, cancers, and cerebrovascular accidents constitute the leading causes of morbidity and mortality in adults at the present time. The prevention and management of these chronic degenerative diseases presents a tremendous challenge for medical and behavioral technology. Because of its importance and the fact that it is a theme which cuts across most of the clinical chapters of the book, prevention of disease through behavior change will also be discussed below.

*Adherence.* In recent years there has been a growing awareness that the failure of patients to adhere to prescribed medical



regimens is probably the single greatest problem in bringing effective medical care to the individual patient. Although the degree of adherence varies with the nature of the regimen, the patient population, and many other variables, it is not uncommon for studies to disclose an adherence rate as low as 50% in many situations. It is, par excellence, a behavioral problem since the task is to alter the patient's health-related behaviors, such as taking prescribed medications in the proper dosage and schedule, adhering to prescribed diets to control diabetes or reduce hyperlipidemia, or modifying life-styles to reduce the risk of cardiovascular disorders.

The issue of adherence is sometimes referred to as compliance in the medical literature. As Stimson (1974) has argued, however, the term compliance is value-laden and suggests a defect or limitation in the patient—a kind of personality characteristic in which the patient “fails to comply with” his doctor's orders. Adherence is the preferable term because it is free of these connotations. Clearly, we must look to the social context in which the patient lives and in which he or she is treated, to identify the environmental variables which will influence adherence behavior.

Central to the study of the problem of adherence is devising reliable methods for assessing and measuring the phenomenon. Numerous studies have shown that the patient interview, the most commonly used method in clinical settings, is notoriously unreliable. There is a general tendency for adherence to be overstated and non-adherence understated by the patient (Dunbar and Stunkard, 1977). Equally invalid are clinical judgments by the prescribing physician. In regimens that consist mainly of taking medications, determining the percentage of pills taken out of the total prescribed is a commonly used measure. Although more valid than interviews and clinical ratings, pill counts are of limited value because the patient may fail to return some of the pills not taken and the procedure does not detect erratic patterns of pill taking.

A more ambitious and sophisticated approach consists of biochemical assessment of markers placed in the medication or of the metabolic by-products of the therapeutic

substance itself in serum or urine. These more direct measures of adherence also have limitations. Generally one cannot determine the exact degree of adherence since they do not usually yield quantitative measures. Also these procedures are only sensitive to recent doses of prescribed medications. Another promising approach consists of having patients maintain daily records of pill taking or other behaviors which constitute the therapeutic regimen. This procedure was first developed in behavioral weight-reduction programs and has been extended, at the University of Pennsylvania, to programs for alcohol abuse, cigarette smoking, and the treatment of hyperlipidemia by dietary programs. It has been used little in programs consisting only of taking medications. Self-monitoring of this sort is a reactive measure in the sense that the recording of desirable activities, such as adhering to a medical regimen, tends to increase these behaviors. Self-monitoring also has its limitations, however: the patient may not comply with the monitoring instructions and there is also the problem of the accuracy of his or her self-reporting.

Finally, some authors have suggested using treatment outcome as a measure of adherence, such as reduction in blood pressure for patients on antihypertensive medications. However, this procedure contaminates two variables—adherence and response to a treatment regimen. It is well known that many patients will respond with a drop in blood pressure to placebo medication because of expectation or other factors. In fact, some studies have shown a rather poor correlation between adherence to antihypertensive regimens and response to treatment (Sackett, Haynes, Gibson, et al., 1975). Nevertheless, this approach may have some clinical usefulness. One may focus on the non-responders to treatment to identify for more intensive study those patients who are not adhering to the treatment regimen, in distinction to those who adhere but fail to respond to the particular drugs prescribed.

A good deal of attention has been focused on demonstrating factors which influence or predict adherence. Surprisingly, common demographic variables such as age, sex, marital status, and socioeconomic status have little independent influence on