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Testing the Biopsychosocial Model: The Ultimate Challenge Facing Behavioral Medicine?

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This article develops the thesis that the ultimate challenge facing behavioral medicine is the empirical testing of the biopsychosocial model. Drawing upon Pepper's (1942) philosophy of science writings, four major ways of thinking (formistic, mechanistic, contextual, and organistic) about health and illness are illustrated. It is proposed that single-category, single-cause, single-effect models of health and illness are being replaced by multicategory, multicause, multieffect models and that this reflects a major paradigm shift in science in general. Basic aspects of systems theory are illustrated and applied to the four major definitions of behavioral medicine and the four major stages of clinical research. It is proposed that research examining interactions cutting across biological, psychological, and social levels underlies the major questions regarding diagnosis, treatment, and prevention. The Patient Evaluation Grid is used to highlight how clinical data can be collected biopsychosocially. The distinction between bodies of knowledge and specialized training in the bodies of knowledge is clarified as it relates to the complimentary roles of psychologists and physicians in behavioral medicine. The emerging roles of psychology as the "middle" discipline and medicine as a biopsychosocial profession are considered in relation to medical education and the practice of behavioral medicine.

The purpose of this article is to consider the thesis that the ultimate challenge facing behavioral medicine is the empirical testing of the biopsychosocial model (e.g., Engel, 1977; Leigh & Reiser, 1980) and to consider the unique roles that psychology as a discipline can play in meeting this interdisciplinary challenge. In the process of discussing these two broad issues, I will consider four major categories of definitions of behavioral medicine and consider the potential for systems theory (de Rosnay, 1979; Miller, 1978; von Bertalanffy, 1968) to provide a unifying, metatheoretical framework for integrating biological, psychological, and social approaches to health and illness. The present article represents a summary and extension of recent writings on systems theory and the interdisciplinary nature of behavioral medicine (Schwartz, 1979, 1980, 1981, 1982, in press-a, in press-b).

As has been discussed elsewhere (Schwartz, 1980; Weiss & Schwartz, 1982), the emergence of behavioral medicine as a new interdisciplinary field (e.g., The Yale Conference on Behavioral Medicine, Schwartz & Weiss, 1978a) has not occurred in isolation. Rather, the emergence of behavioral medicine should be seen as part of a broad trend toward synthesis that is occurring throughout the scientific community. The beginnings of this trend toward synthesis can be traced at least as far back as the writings of Cannon (1932). Cannon planted the seeds for considering homeostasis to be a general process that could be fruitfully applied not only to biology, but to psychology and sociology as well (see Cannon, 1932; Chap. 18). It was within this broad context that general systems theory was initially conceived (e.g., von Bertalanffy, 1968) and developed (e.g., Boulding, 1978; Miller, 1978).

Traditional boundaries between disciplines are currently being broken down, and new interdisciplinary fields are emerging at a remarkable rate. Over the past two decades,

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numerous interdisciplinary fields have been formed within the behavioral and biomedical sciences as well as between the behavioral and biomedical sciences. Examples of new interdisciplinary fields connecting different disciplines within the behavioral sciences include social anthropology, political psychology, and ecological psychology. Examples of new interdisciplinary fields connecting different disciplines within the biomedical sciences include biophysics, neurochemistry, and neuroendocrinology. Examples of new interdisciplinary fields connecting different disciplines between the behavioral and biomedical sciences include psychophysiology, behavioral neurology, and sociobiology. In fact, it is not uncommon now to see three different disciplines connected, such as social psychophysiology, psychoneuroendocrinology, and psychoneuroimmunology.

It is within this broad scientific context that biopsychosocial approaches to health and illness have been formulated (e.g., Engel, 1977; Leigh & Reiser, 1980). Stimulated by the realization that the boundaries separating disciplines were becoming less rigid, that new connections were becoming possible between disparate disciplines (see Agras, 1982, this volume), and that complex problems of health and illness were turning out to be inherently multidimensional in nature, researchers and clinicians from diverse disciplines have become motivated to seek better ways of building bridges between disciplines and of establishing a common set of terms and principles. I believe that this movement toward synthesis reflects a broad paradigm shift (Kuhn, 1962), whose impact is just beginning to be recognized (Schwartz, 1978; 1980). Part of this movement includes the recognition that fundamental principles implicit in the biopsychosocial model need to be made explicit and tested empirically. Behavioral medicine could provide the interdisciplinary framework necessary to specify and evaluate these fundamental principles.

Four Ways of Thinking About Health and Illness

To understand the paradigmatic significance underlying the emergence of biopsychosocial approaches to health and illness, it is helpful to consider how the biopsychosocial perspective is different from other major perspectives. It is possible in the limited space of this article to illustrate the four major approaches to health and illness only briefly. My analysis draws on Pepper's (1942) philosophy writings as put into operation by the research of Harris, Fontana, and Dowds (1977).

Pepper (1942) proposed that there are four major ways that people typically explain nature. He called these four ways of thinking "world hypotheses." Pepper termed the four world hypotheses *formistic*, *mechanistic*, *contextual*, and *organistic*. Since these ways of thinking are general, they can be applied to any aspect of nature, including health and illness. The essence of Pepper's four categories can be summarized as follows.

Formistic

This thinking style is essentially categorical. Things and processes are presumed to be part of certain categories and not part of other categories. Thus, formistic thinking is "either–or" thinking. Things are, therefore, binary.

In terms of medicine, to a formistic thinker a person would be either sick or well. A disease would be either present or not. Formistic explanations for disease would be made by placing the person within certain disease-producing categories. A person might be sick because he or she had a certain personality, belonged to a certain ethnic group, and so forth. Obviously, categorical thinking is essential to all science. However, some disciplines and theorists tend to emphasize formistic thinking to the exclusion of other modes of thinking (e.g., pathology is primarily a formistic-based discipline; until very recently, personality psychology tended to be primarily a formistic subarea within psychology).

Mechanistic

This thinking style is essentially single-cause, single-effect. Things and events are presumed to occur as a result of specific, single causes or as chains of single causes. Like formistic thinking, mechanistic thinking is a form of "either–or" thinking.

In terms of medicine, examples of mechanistic thinking include the beliefs that specific germs cause specific diseases and that specific life experiences cause specific injuries or problems. Causes can be either biomedical or behavioral, but they must be specific and singular. Hence, to a mechanistic thinker, lung cancer would be explained as being caused by a particular pollutant, or tension headaches would be explained as being caused by a particular stress-reinforcement history. Obviously, mechanistic thinking (like formistic thinking) is essential to all science. However, some disciplines and theorists tend to emphasize mechanistic thinking to the exclusion of other modes of thinking (e.g., internal medicine has tended to emphasize mechanistic explanations, as has the behavioristic movement in psychology).

Contextual

This thinking style is essentially relational. To a contextual thinker, there is no way of explaining single categories or events. On the contrary, there are at least two ways of explaining everything, and phenomenon in nature always depend on the context in which they exist as well as the context of the observer. Hence, all things are multicaused rather than single-caused.

Contextual thinking has not been prominent in Western medical science (which tends to emphasize a combination of formistic and mechanistic perspectives). However, Eastern approaches to medicine, such as acupuncture, have used contextual thinking. Conclusions such as "disease is unhealthy or healthy, depending upon the way you look at it" or "disease is caused by the germ or by the person, depending upon the way you look at it" illustrate the contextual perspective. Contextual thinking, that is, relational thinking, is currently adopted primarily in physics, in which Einstein's relativity theory and Heisenberg's uncertainty principle have dramatically changed the way physicists view the world (see Capra, 1977 and Zukav, 1979, for an overview of quantum physics and its synthesis with Eastern philosophies). As will become clear below, contextual thinking is necessary to and is implicit in systems thinking, as formistic thinking is necessary to and is implicit in mechanistic thinking. In fact, the role of contextual thinking in modern medicine makes more sense when Pepper's last category of world hyotheses is deeply understood.

Organistic

This thinking style is essentially interactive. Unique events are presumed to emerge as a result of the interaction of multiple causes. Combinations of causes are believed to lead to the emergence of new phenomenon, and hence, new "wholes." Organistic thinking is, thus, wholistic thinking. The essence of systems thinking is that the functioning of a system as a whole emerges out of the dynamic interactions of its parts (subsystems) and the system's interaction with its environment (the supra system of which the system is a part).

In terms of medicine, examples of organistic thinking include the belief that specific diseases (constellations of symptoms) represent the complex *interaction* of specific environment stresses (including germs) *and* the organism in question (including its genetic and experiential history) and that biological and behavioral stresses always interact with each other to produce particular constellations of signs and symptoms in particular individuals. To a systems thinker, one can think about psychological stresses increasing susceptibility to physical stresses *and* physical stresses increasing susceptibility to psychological stresses. To a systems thinker, both of these statements are partially true, and, furthermore, both statements are incomplete contextual interpretations about how different stresses interact to produce specific diseases. Hence, systems thinking is "and" thinking (rather than "either–or" thinking). Systems thinking is a form of "pattern" thinking (see Schwartz, 1979). Multifactorial, interactive systems thinking is very common in engineering and in areas of biology in which the integration of multiple factors is obviously needed in order to make sense out of the system being studied (e.g., cardiovascular hemodynamics; see Schwartz, 1982).

To summarize, Pepper's (1942) first two ways of thinking, formistic (categorical) and mechanistic (cause–effect), represent con-

crete, relatively binary, single-category, single-cause approaches to viewing health and illness. Pepper's second two ways of thinking, contextual (relational) and organistic (interactive-systems) represent more dynamic, relatively continuous, multicategory, multicause approaches to viewing health and illness. Much of medicine to date has adopted the conceptual and research designs implicit in the first two ways of thinking. It is clear that much progress has been made to date using this paradigm. However, this paradigm is turning out to be insufficient at both theoretical and research levels in accounting for multiple variables that interact and thereby affect health and illness. What I am suggesting is that when behavioral medicine adopts a biopsychosocial approach, it implicitly adopts Pepper's second two ways of thinking. Changes in theory and research design follow accordingly.

Implications for Stages of Clinical Research

I believe it is possible to view the natural history of research in medicine (and research in general) as representing a developmental progression of these four major ways of thinking. The stages are as follows:

Stage 1: Formistic

While working clinically, it is observed that certain categories of patients tend to show one thing when compared with others. What these patients may show are certain signs and symptoms. Or, particular treatments may appear to work in particular patients. A category emerges. An impression is formed. Once the category is specified, the next question that typically arises is "What is responsible for these observations—what is the (single) cause?"

Stage 2: Mechanistic

The investigator attempts to specify a particular cause to explain the observation. Single-cause research designs typically include control groups for the presence and absence of the presumed cause or may attempt to manipulate the presumed cause in a more parametric fashion (i.e., to obtain dose/response curves). The limits to the observation are sought. For whom does it work and under what conditions does it work? What is its cost/benefit ratio in terms of positive and negative effects, including economics?

Stage 3: Contextual

Disillusionment sets in as the picture becomes more complex. Competing "single" causes are found, and so-called moderating variables are discovered that may attentuate, mask, or even at times reverse the effects of the presumed single cause. An attempt is made to resolve this contextual problem (i.e., what "the" mechanism is depends in part on what you decide to measure and how you look at it) either by (a) breaking the problem into subproblems or areas—setting up new formistic categories, and thus allowing the investigator to return to Stage 1 and 2 research, (b) ignoring certain data that do not fit with the presumed primary mechanism, (c) giving up on research as being too complex, or (d) adapting an organistic-systems approach to the research.

Stage 4: Organistic

Resolution occurs by deliberately adopting a multicategory, multicause, multieffect conceptual and research model. The competing interpretations and data are synthesized by proposing an interactive model, and then conducting multivariant, multidimensional research to uncover the relative importance of the different variables as they interact. This kind of research comes up with conclusions such as "Stress X will lead to a particular pattern of signs and symptoms in these kinds of individuals under these kinds of conditions, etc."

Implicit in the biopsychosocial approach to behavioral medicine is the view that variables interact and that health and illness can best be understood by considering interactions of variables that cut across multiple levels. This view makes the task of research and practice much more difficult because it requires that multiple variables be assessed and then integrated and interpreted. I believe that to the extent that the growth of knowledge is itself developmental and evolutionary (e.g., see Boulding, 1978), we may be witnessing an emerging new era in the evolution of sci-

entific knowledge per se, an era in which research and applications are being approached from a multivariable, multilevel perspective in general. Evidence for this emerging perspective can be found in all disciplines, from subatomic physics through ecology and astronomy. Systems theory, as synthesized by theoreticians such as Miller (1978) provides an approach to Stage 4 research, one that connects disciplines and contexts. (Miller received basic research and clinical training in both the biomedical and behavioral sciences, receiving an MD plus a PhD in psychology.)

It should be noted that not all writers view the emergence of systems thinking as reflecting a developmental process of styles of thinking. Some writers consider systems thinking to be an approach that is simply complementary to the more well-known analytic approach. It is possible to contrast what deRosnay (1979) calls an "analytic" approach with what he calls a "systemic" approach to research. As shown in Table 1 (from deRosnay, 1979, pg. 79), the analytic approach appears to reflect a more reductionistic and serial process, whereas the systemic approach appears to reflect a more synthetic and parallel process. It could be argued that science has tended to overemphasize the former at the expense of the latter and that it may now be possible to restore the balance. On the other hand, I believe it is constructive to realize that the analytic approach tends to be formistic and mechanistic, whereas the systemic approach tends to be contextual and organistic. Ideally, what I have termed Stage 4 research is not a rejection of analytic thinking, but is a synthesis of such thinking with multicause, multieffect models. This is the developmental/synthetic position also taken by deRosnay (1979).

Systems Theory and Behavioral Medicine

Systems theory is concerned with general principles that are hypothesized to be applicable to all aspects of nature. It is important to understand that these general principles

Table 1
Comparison of the Analytic Versus Systemic Approach According to deRosnay (1979)

Analytic approach	Systemic approach
Isolates, then concentrates on the elements	Unifies and concentrates on the interaction between elements
Studies the nature of interaction	Studies the effects of interactions
Emphasizes the precision of details	Emphasizes global perception
Modifies one variable at a time	Modifies groups of variables simultaneously
Remains independent of duration of time; the phenomena considered are reversible	Integrates duration of time and irreversibility
Validates facts by means of experimental proof within the body of a theory	Validates facts through comparison of the behavior of the model with reality
Uses precise and detailed models that are less useful in actual operation (e.g., econometric models)	Uses models that are insufficiently rigorous to be knowledge but are useful in decision and action (e.g., models of the Club of Rome)
Has an efficient approach when interactions are linear and weak	Has an efficient approach when interactions are nonlinear and strong
Leads to discipline-oriented (juxtadisciplinary) education	Leads to multidisciplinary education
Leads to action programmed in detail	Leads to action through objectives
Possesses knowledge of details, poorly defined goals	Possesses knowledge of goals, fuzzy details

Note. From Joel deRosnay, *The Macroscope.* New York: Harper & Row, 1979. English translation copyright © 1979 by Harper & Row Publishers, Inc. Reprinted with permission of Harper & Row Publishers, Inc.

were not contrived. Rather, they were derived from a close analysis of findings independently discovered in diverse disciplines. The independent findings, considered collectively, led to the discovery of general principles that ultimately apply to, and therefore unite, diverse findings and disciplines. It is, of course, impossible to present the principles of systems theory here, given the limited space available (see deRosnay, 1979; Miller, 1978; Weinberg, 1975). However, a few general points must be made in order to consider the question of what it means to test the biopsychosocial model empirically.

As shown in Table 2 (from Schwartz, 1981), it is possible to organize various systems in nature in terms of their level of complexity. Curiously, this organization not only parallels evolutionary theory's explanation of the development of physical, biological, psychological, and social systems (in that order; see Boulding, 1978) but also illustrates how the various scientific disciplines have evolved developmentally to study the unique properties that emerge at each level. These unique properties are called "behaviors" in systems language. All systems "behave" (they can show action/reaction patterns), and scientists, be they physicists, physiologists, psychologists and so forth, ultimately study the behavior of systems at their given emergent level. The unique behaviors that emerge at a given level justify the formation of new disciplines to collect and organize the emergent bodies of knowledge.

The reader will note, of course, that the term *behavior* can be (and has been) used in different ways to encompass various levels of systems. To reduce confusion, I have proposed that the systems (meta) use of the term BEHAVIOR be capitalized and that the more typical and limited use of the term *behavior*, as employed in lay language and in disciplines such as anthropology, psychology, and sociology, remain in small letters. As illustrated in Table 3 (from Schwartz, 1981), different definitions of behavioral medicine can be explained in terms of different uses of the term *behavior*.

The most restricted meaning of the term *behavior* is used by behavioral psychology, as epitomized by the Skinnerian perspective (Skinner, 1954). Here behavior is limited to overt, observable actions made by organisms. Thus, behavioral medicine is viewed as adopting behavioral psychology research methods and behavioral therapy techniques to medical problems. It is worth noting that Pomerleau and Brady's (1979) adoption of this relatively restricted definition of behavioral medicine has important precedents, even within the biofeedback area per se. It should be recalled that the first research-based book on clinical applications of biofeedback was titled *Biofeedback: Behavioral Medicine* (Birk, 1973) and drew on the learning-theory roots of biofeedback as the primary means of conceptualizing the etiology and treatment of psychophysiological disor-

Table 2
Levels of Complexity in Systems and Associated Academic Disciplines

Level and complexity of the system	Academic discipline associated with the level of the system
Beyond earth	Astronomy
Supranational	Ecology
National	Government, political science, economics
Organizations	Organizational science
Groups	Sociology
Organism	Psychology, ethology, zoology
Organs	Organ physiology, (e.g., neurology, cardiology)
Cells	Cellular biology
Biochemicals	Biochemistry
Chemicals	Chemistry, physical chemistry
Atoms	Physics
Subatomic particles	Subatomic physics
Abstract systems	Mathematics, philosophy

Note. According to systems theory, in order to understand the BEHAVIOR of an open system at any one level, it is essential to have some training in the academic disciplines below that level, plus have some training in the relevant discipline at the next highest level as well. From "A Systems Analysis of Psychobiology and Behavior Therapy: Implications for Behavioral Medicine" by G. E. Schwartz, *Psychotherapy and Psychosomatics*, 1981, *36*, 159–184. Copyright 1981 by *Psychotherapy and Psychosomatics*. Reprinted by permission.

ders. Also, as noted in Schwartz (1981) there are ultimately some important parallels between Skinner's theoretical approach to science and the early systems theorists. Both theorists emphasized the study of behavior, although the latter theorists were more comfortable about *inferring* underlying processes from overt behavior (see below).

Of course, the term *behavior* is typically used more broadly than behavioral psychologists do. As indicated in Table 3, the second definition of behavior, and hence behavioral medicine, equates behavior with the whole discipline of psychology. Therefore, thoughts, feelings, awareness, and so forth, would be included as part of behavior (even though they are inferred), and the discipline of psychology would be defined as "the" behavioral science. Thus, behavioral medicine would be defined as the discipline of psychology applied to medicine.

The recent emergence of health psychology as a subspecialty in psychology reflects the concern of psychology, broadly defined, to apply its knowledge and skills to health and illness. However, it should be emphasized that Division 38 does not equate health psychology with behavioral medicine. This is because the founders of Division 38 viewed the term *behavior* (as used in behavioral medicine) to be broader than just psychology. Hence, health psychology is a part, not the whole, of behavioral medicine.

As mentioned above, the term *behavior* is often used by disciplines other than psychology. Therefore, behavioral science can refer not only to psychology but to such sciences as anthropology, sociology, and political science. This was the definition of behavior implicitly proposed at the Yale Conference on Behavioral Medicine (Schwartz & Weiss, 1978a) and adopted by the Academy of Behavioral Medicine Research (Schwartz & Weiss, 1978b). Thus, medical anthropology and medical sociology can contribute to behavioral medicine, just as health psychology can. Implicit in the Yale Conference view of the term *behavior* was the idea that a comprehensive, biopsychosocial approach to health and illness should be adopted

Table 3
Four Definitions of Behavior Using Behavioral Medicine as an Example and Moving Up Levels of Complexity (in Systems Terms)

Perspective	Definition
1. Behaviorists and behavior therapists	Behavior here refers to one subarea in the discipline of psychology, emphasizing learning and the strict measurement of observable events. Behavioral medicine here refers to the application of behavior therapy per se (learning theory) to medicine.
2. General psychology	Behavior here refers to the study of behavior of organisms, broadly defined, and encompasses the entire discipline of psychology. Here psychology is "the" behavioral science. Behavioral medicine here refers to the application of all subareas of the discipline of psychology to medicine.
3. Arts and Sciences	Behavior here refers to the study of behavior of organisms, very broadly defined, and encompasses not only the discipline of psychology, but the disciplines of anthropology, sociology, political science, and so forth. Behavioral medicine here refers to the application of all behavioral sciences (psychology being only one such science) to medicine. This is the definition of behavioral science used at the Yale Conference on Behavioral Medicine (Schwartz & Weiss, 1978a).
4. Systems theory	BEHAVIOR here refers to the study of BEHAVIOR of systems, not just organisms. All scientific disciplines, including physics, chemistry, biology, as well as the "behavioral sciences" mentioned in Definition 3, would be reclassified here as BEHAVIORAL sciences. BEHAVIORAL medicine here refers to the application of systems theory and the integration of all scientific disciplines to medicine (Schwartz, 1979).

Note. From "A Systems Analysis of Psychobiology and Behavior Therapy: Implications for Behavioral Medicine" by G. E. Schwartz, *Psychotherapy and Psychosomatics*, 1981, *36*, 159–184. Copyright 1981 by *Psychotherapy and Psychosomatics*. Reprinted by permission.

and that this perspective should be the hallmark of the emergence of behavioral medicine.

I have included the systems definition of BEHAVIOR in Table 3, and its implications for BEHAVIORAL medicine, to illustrate the logical extension of this progression. It makes sense that if all disciplines could consider themselves to be BEHAVIORAL sciences, and therefore could develop a common, metatheoretical language regarding key concepts, research design, and statistics, then interdisciplinary collaborative research would be facilitated. As mentioned in the previous section, issues such as multicausality, emergence, part/whole relationships, multivariant research designs and analysis, and so forth, are not restricted to any one discipline. To the extent that these issues can be shared by all disciplines, both behavioral and biomedical, the potential exists for developing a more unified approach to science, one that could be more BEHAVIORAL (i.e., systems) in orientation.

Before addressing the ultimate challenge of actually testing the biopsychosocial model, brief mention should be made of the relationship of systems theory to control theory, or cybernetic theory. Control theory (e.g., Carver & Scheier, 1981) is actually a subset of systems theory. As I have discussed elsewhere (see Schwartz, in press-b), control theory can be renamed Regulation Theory in the sense that the theory is concerned with general principles by which subsystems regulate each other to produce ordered, organized BEHAVIORS in whatever system is being studied. It follows that Disregulation Theory (Schwartz, 1977, 1979, in press-b) is concerned with general principles by which key regulatory processes are either delayed, diminished, distorted, or, in extreme cases, disconnected, thereby producing disorder and disease. Principles of disregulation are, therefore, the converse of principles of regulation, and potentially can be applied to any system. Control (regulation) theory provides important conceptual, methodological, and statistical principles that can potentially integrate biological, psychological, and social approaches to health and illness, but these specific principles are beyond the scope of the present article (see Schwartz, in press-b).

The Challenge in Testing the Biopsychosocial Model

There are many questions implicit in the biopsychosocial approach to health and illness that are fundamental to systems theory and that need to be investigated empirically. First, the biopsychosocial model proposes that medical diagnosis should *always* consider the interaction of biological, psychological, and social factors in order to assess a person's health and to make recommendations for treatment. The assumption is made that the more information that is collected and the better the information is organized, the better will be the diagnosis. This, of course, is an empirical question. For example, Leigh and Reiser (1980) have proposed a general biopsychosocial procedure for collecting clinical information in order to make diagnoses and recommendations for treatment. Figure 1 illustrates the kinds of information collected and how it is organized in the Patient Evaluation Grid (PEG). Based on this information, diagnoses are made in all three dimensions, and treatment recommendations (both short term and long term) are recommended that cut across all three dimensions (see Figure 2.)

The PEG system of organizing clinical data is noteworthy if for no other reason than that it encourages health providers to assess individuals comprehensively and consider illnesses interactively. However, no research has been published to date showing that such analyses lead to better diagnosis and, hence, to better predictions about treatment and follow-up. This is clearly a challenge for the future.

A second major prediction of the biopsychosocial model is that *treatments will interact* with each other as well as with the person and his or her environment. Theoretically, by assessing people biopsychosocially, it should be possible to (a) tailor therapies to the individual more effectively, (b) consider diseases not in isolation, but in interaction, and therefore make recommendations that may apply to two or more problems simultaneously, and (c) look for treatment interactions across modalities, that could have additive and possibly synergistic effects. These points are discussed in more detail in

PATIENT EVALUATION GRID (PEG)

DIMENSIONS	CONTEXTS		
	CURRENT (Current States)	RECENT (Recent Events and Changes)	BACKGROUND (Culture, Traits, Constitution)
BIOLOGICAL	Symptoms Physical examination Vital signs Status of related organs Medications Disease	Age Recent bodily changes Injuries, operations Disease Drugs	Heredity Early nutrition Constitution Predisposition Early disease
PERSONAL	Chief complaint Mental status Expectations about illness and and treatment	Recent illness, occurrence of symptoms Personality change Mood, thinking, behavior Adaptation, defenses	Developmental factors Early experience Personality type Attitude to illness
ENVIRONMENTAL	Immediate physical and interpersonal environment Supportive figure, next of kin Effect of help-seeking	Recent physical and interpersonal environmental Life changes Family, work, others Contact with ill persons Contact with doctor or hospital	Early physical environment Cultural and family environment Early relations Cultural sick role expectation

Figure 1. Form used by biopsychosocially oriented clinicians to organize diagnostic information in biological, personal (psychological), and environmental (primarily social) dimensions. (From H. Leigh and M. F. Reiser, *Biological, Psychological and Social Dimensions of Medical Practice.* New York: Plenum Press, 1980. Copyright 1980 by Plenum Press. Reprinted by permission.)

Schwartz (1981). It should be emphasized here that a major challenge in the biopsychosocial approach to behavioral medicine is that biological and psychological treatments may interact, sometimes beneficially and sometimes detrimentally. If it could be demonstrated that specific combinations of treatments were more effective, in terms of greater main effects, fewer negative side effects (possibly by using smaller dosages), better compliance, and so forth, this would be of fundamental importance. Drug/behavior therapy interactions, or surgery/education interactions, in terms of response to treatment, are possible if not probable. If such interactions are documented, the implications for diagnosis and treatment will be substantial. A number of research projects currently funded by the National Institutes of Health are investigating such interactions, and more are clearly needed.

Of course, it could be (and should be) argued that even the narrowest definition of behavioral medicine (Definition 1 from Table 2) involves the examination of biobehavioral interactions. In that case, why do I recommend evaluating the biopsychosocial

PATIENT EVALUATION GRID (PEG) - Management Form

DIMENSIONS	DIAGNOSIS	THERAPY PLANS	
		SHORT TERM	LONG TERM
BIOLOGICAL			
PERSONAL			
ENVIRONMENTAL			

Figure 2. Form used by biopsychosocially oriented clinicians to organize diagnoses and treatment recommendations in biological, personal (psychological), and environmental (primarily social) dimensions—see Schwartz (1981) for applying treatments at one level to diseases manifested at other levels. (From H. Leigh and M. F. Reiser, *Biological, Psychological and Social Dimensions of Medical Practice.* New York: Plenum Press, 1980. Copyright 1980 by Plenum Press. Reprinted by permission.)

model itself, and why do I suggest that a more comprehensive, systems approach to data collection and analysis be implemented and investigated? The reason should be self-evident. To the extent that the biopsychosocial approach more effectively stimulates *common* theories and research designs, facilitates *interdisciplinary* thinking and research, and encourages greater *synthesis* among *numerous* variables, it has the potential to establish a more effective, multicause, multieffect approach to health and illness.

Future research can determine whether combinations of treatments, appropriately matched to individual patients, not only will be more effective in terms of symptom removal and general health but also will be more cost effective. However, the question arises, will a biopsychosocial perspective help encourage the integration of these treatment strategies so that, for example, the significant role that early health behaviors play in adult health and illness will be recognized and manipulated preventively? Will a biopsychosocial perspective encourage the training of future researchers who will be better equipped to integrate findings across levels and hence, disciplines?

In a sense, the systems approach argues that many specific disciplines, by looking "microscopically," tend to lose the forest for the trees. On the other hand, it could be argued that the systems approach, by looking "macroscopically," may lose the trees for the forest! In implementing and evaluating a research version of the PEG system in the Yale Behavioral Medicine Clinic, I have observed that the coordinating physician, in an attempt to think comprehensively about the patient, may sometimes miss key details because of his or her focus on the larger picture. A balance is clearly needed between seeing the whole and seeing the parts. Such is the inherent tension in systems thinking.[1]

The Roles for Psychology and Medicine and for Psychologists and Physicians in Behavioral Medicine

If a biopsychosocial approach to behavioral medicine is adopted, the roles for PhD-trained psychologists in the discipline of psychology become clearer. First, PhD psychologists are trained to be scientists in general. Psychologists supposedly understand the philosophy of science, research design, and statistical techniques appropriate for analyzing various types of data. Psychologists should continue to become more sophisticated in multivariant approaches to theory, research design, and analysis, since this perspective is fundamental to testing and implementing the biopsychosocial model. To the extent that most physicians are trained primarily as practitioners, psychologists can play a major role in helping biomedical clinical researchers design, analyze, and interpret their data, regardless of subspecialty. Psychologists can play a major role in helping design basic and clinical-evaluation research in behavioral medicine because of their general research training.

Besides contributing their skills in research design and statistical analysis, psychologists can make, and are making, unique contributions to the "psycho" part of the biopsychosocial model. Theoretically, psychologists should know more about the psychological part than any other discipline. It should ultimately be psychologist's responsibility to demonstrate the importance of the discipline's basic and clinical findings to the interdisciplinary field of behavioral medicine. Health psychology therefore becomes the subspecialty within psychology that should integrate experimental, personality, physiological, social, clinical, educational, and other aspects of psychology as they relate to health and illness.

Up to now I have talked about some specific roles that psychologists can play in behavioral medicine. However, it is important to distinguish clearly between bodies of knowledge versus people having specialized training in bodies of knowledge. As indicated in Table 4, the terms *biology* and *psychology* refer to bodies of knowledge at a given level (a given discipline), whereas the terms *biologist* and *psychologist* refer to persons who have had specialized training in these particular bodies of knowledge. It follows that the

[1] It is possible that the tension between seeing the whole and seeing the parts may reflect a fundamental quality of information processing that is expressed at various levels in all systems, including the human brain (see Kinsbourne, 1982).

Table 4
Examples of Single-Level/Single-Discipline Versus Multilevel/Multidiscipline Bodies of Knowledge and Labels for Persons With Specialized Training in These Bodies of Knowledge

Discipline	Body of knowledge	Specialized training
Single level/ single discipline	Biology Psychology	Biologist Psychologist
Multilevel/multi-discipline	Psycho-physiology Medicine	Psycho-physiologist Physician

terms *psychophysiology* and *medicine* refer to bodies of knowledge that cross many levels (multiple disciplines), and the terms *psychophysiologist* and *physician* refer to persons who have had specialized training in these interdisciplinary bodies of knowledge.

The distinction between bodies of knowledge and persons specifically trained in bodies of knowledge is fundamental to understanding a deep implication of system's theory. From a systems perspective, psychology as a body of knowledge is becoming more important to the interdisciplinary body of knowledge in medicine. Any person can potentially contribute to the knowledge base of psychology or medicine—in fact physicians can (and some do) contribute to the knowledge base of psychology, and psychologists can (and some do) contribute to the knowledge base of medicine. It follows, therefore, that psychologists do not "own" the knowledge of psychology and that physicians do not "own" the knowledge of medicine. Furthermore, it follows that a psychologist with detailed knowledge of physiology and medicine can make important contributions to the theory and practice of medicine and that a physician with detailed knowledge of psychology can make important contributions to the theory and practice of psychology. Hence, what should determine the specific roles that particular persons play in research, education, and practice is an interaction of (a) the bodies of knowledge they actually know, (b) the bodies of knowledge necessary to conceptualize and solve the problems comprehensively, and (c) legal and ethical principles that theoretically should reflect (a) and (b).

I have included psychophysiology in Table 4 to illustrate the fact that persons with specialized training in certain interdisciplinary fields do not necessarily have formal degrees in such training. This lack may be an advantage. Implicit in the Yale Conference perspective on behavioral medicine (Schwartz & Weiss, 1978a) was the acknowledgement that persons could become experts in this interdisciplinary field without receiving a formal degree in the field. In fact, it was generally believed that *not* establishing behavioral medicine as a separate interdisciplinary field requiring a formal degree program would encourage persons from biology, psychology, sociology, medicine, nursing, and so forth, to become "behavioral medicinists," so to speak, in the same way that all of these persons could become psychophysiologists if they received the appropriate additional interdisciplinary training.

On the research side, the above issues are relatively straightforward. However, on the clinical side (especially in clinical practice per se), the recommendations become more controversial and can evoke strong emotions on all sides. Implicit in the biopsychosocial approach to behavioral medicine is that a team approach to diagnosis and treatment is necessary in order to ensure that appropriate biological, psychological, and social data are collected, integrated and interpreted comprehensively. No one discipline, by definition, represents all of this information. What is often confused, however, is that medicine is *not* a discipline—it is an *interdiscipline* that primarily operates as a profession.[2] The profession of medicine is concerned with the diagnosis and treatment of illness. Being an applied profession and not a basic discipline, medicine, like other applied professions such

[2] The PsyD, modelled after the MD, has attempted to shift psychology from being a broad, basic body of knowledge discipline to becoming a focused, single-discipline applied profession. Note that the MD ideally fosters the training of interdisciplinary professionals, whereas the PsyD fosters the training of single-discipline professionals.

as engineering, should not (at least theoretically) focus on only one discipline per se. Ideally, general medical education should include appropriate basic and clinical information in all three major domains (biological, psychological, and social). Of course, medical education has been heavily skewed in the direction of the discipline of biology. With the emergence of behavioral medicine, some of the needed balance may be restored.[3]

It should be acknowledged that of all the subspecialties in medicine, psychiatry has worked longest and hardest to develop and implement a biopsychosocial approach to diagnosis and treatment (e.g., Engel, 1977; Leigh & Reiser, 1980). I believe that psychiatry deserves credit for making this important effort. Recently Engel (1982) has proposed that psychiatry should continue to develop the biopsychosocial perspective and that psychiatrists should play a major role in teaching all future physicians to adopt this general perspective, regardless of specialty. It follows from the perspective of the present article that the teaching of the biopsychosocial model, especially as it is implemented in comprehensive medical practice, will likely fall on physicians having the necessary knowledge that spans the three major disciplines. These physicians may be the well-rounded, biopsychosocial-trained consultation–liason psychiatrists of the future.

However, it also follows from the perspective of the present article that the thorough teaching of the discipline of psychology to medical students should be done by psychologists specializing in health. If future research continues to demonstrate important contributions of psychology to the practice of medicine in general, it may become justifiable (if not necessary) for separate departments of psychology to emerge in all medical schools (just as other basic sciences such as physiology developed separate departments in medical schools) so as to foster (and insure) that state-of-the-art research and teaching of the discipline of psychology is provided for all medical students. In other words, psychology as a body of knowledge may become not only a necessary component of psychiatry but a necessary component of all subspecialties in medicine. This admittedly controversal conclusion follows directly from the thesis that psychology is a discipline that is an integral part of the biopsychosocial model and that the biopsychosocial model potentially applies to all aspects of the medical profession and not to psychiatry only.

What becomes the relationship between psychologists and physicians in the practice of behavioral medicine? The answer to this question depends on one's definition of behavioral medicine. If it is some version of Definitions 1 and 2 from Table 3, then the argument can be made that diagnosis and treatment should be made by a physician/psychologist team, and if the problem is primarily behavioral in terms of treatment modality, then responsibility and care for the patient should be taken primarily by the psychologist (i.e., the psychologist should lead the team). However, if the definition of behavioral medicine is some version of Definitions 3 and 4, then the argument can be made that the general physician (whose responsibility legally cuts across biological, psychological, and social aspects of a person's life) should always coordinate the team, and various specialists should collaborate as part of the interdisciplinary team. If a given specialist has not been formally trained biopsychosocially in terms of content and clinical skills (e.g., although the average health psychologist may be a first-rate specialist in the discipline of psychology with a subspecialty in health, he or she is typically not well trained in medicine from a biopsychosocial perspective), then this health provider should be content to be "part" of the "whole," and not attempt to represent the "whole" in

[3] The ordering of terms in the biopsychosocial model is not incidental. The order of terms not only reflects evolutionary development but also reflects society's need to have persons particularly skilled in diagnosing and treating physical problems. However, with the emergence of behavioral medicine, it is becoming clear that a biopsychosocial perspective requires more emphasis on the social and psychological levels than has heretofore been provided. The emergence of social psychophysiology, an interdisciplinary area concerned with the effects of social stimuli on psychological and thereby physiological processes, has the potential to help restore the balance further through its emphasis on the reverse order of terms (Schwartz, in press-b).

terms of practice and responsibility. The Yale Behavioral Medicine Clinic has adopted the model that although psychologists are a fundamental (and therefore necessary) part of a biopsychosocial team, psychologists are there representing their discipline and, hence, are specialists. The well-rounded physician of the future trained in the interdisciplinary profession of medicine rather than in the discipline of biology, psychology, or sociology per se, becomes the person best equipped to take legal and ethical responsibility for *integrating* and *coordinating* the patient's care biopsychosocially. (See Schwartz, 1981 for a further discussion of these issues).[4]

In the areas of disease prevention and health promotion, before serious chronic physical disease emerges, psychology as a discipline and psychologists as practitioners should play a leading role. However, taking a biopsychosocial approach to the diagnosis and treatment of existing disease places psychology as a discipline more in the "middle" of the interdisciplinary field. How psychology assumes this responsibility will depend on its ability to advance as the leader of its discipline and to become a team player in terms of integrating its discipline widely into the profession of medicine as a whole. Systems theory can help foster both of these goals.

[4] In the Yale Behavioral Medicine Clinic, psychiatrists who want the right to serve as a coordinating physician must take the responsibility to behave as a biopsychosocial clinician. This means that the psychiatrists must do physicals and lab tests on patients and administer drugs for physical diseases as appropriate. These biopsychosocial physicians have what Jeanne Schwartz and I call the "51%" rule when it comes to decisions about clinical management. In cases of disagreement among team members, the coordinating physician can evoke the 51% rule and make a final decision that cuts across modalities and levels of treatment. The 51% rule provides a general guideline for resolving clinical disagreements that can occur on an interdisciplinary team. Although the coordinating physician has the right (and responsibility) to make final decisions regarding a patient's treatment plan, the 51% rule indicates that the other members of the team have very strong input into treatment plans and follow-up.

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