

misattributions of bodily sensations, on simple self-reports of bodily sensations was thought to index a person's arousal-drive at that moment in time. This conceptualization has led to most studies of physiological processes and social behavior being conducted with little need for physiological recording or concern about the underlying physiological or bioelectrical mechanisms.

Moreover, there is little hint that matters are rapidly improving. In reviewing the literature on cognitive dissonance a decade ago, Kiesler and Pallak (1976) noted in a strikingly contemporary tone (e.g., see Elkin & Leippe, 1986) that:

We use the terms motivation (drive) and arousal loosely and interchangeably. . . . We recognize the continuing controversy regarding these concepts in the literature in experimental psychology. . . . Our simplistic use of the terms does not imply a theoretical stance on our part, but rather reflects the state of the art in social psychology. (p. 1015)

Although this use by social psychologists may have appeared reasonable at one time, it is important to note that, whether intended or not, this viewpoint *does* represent a theoretical stance—and one that strikes contemporary investigators in other fields as inexplicable if not somewhat naive. As Fowles (1980) summarized in a review of the literature on physiological arousal not long after the appearance of Kiesler and Pallak's review:

The effect of attempting to assimilate all of these traditions to a single arousal theory was to create a model in which the reticular activating system was assumed to serve as a generalized arousal mechanism which responded to sensory inputs of all kinds, energized behavior, and produced both EEG and sympathetic nervous system activation. . . . As is well-known, this model failed the empirical test rather badly. (p. 88)

All the more striking is that advances in the area of experimental psychology pertaining to cognition have had a large impact on conceptualizations in social psychology during the past decade, while cognitive psychologists and artificial intelligence researchers have begun to show increasing interest in the "wetware" (neural circuitry) of the human organism.

Even the early attraction of psychophysiological conceptualizations and procedures to social psychologists for purposes of construct validation proved a virtual dead end. When physiological procedures were used *successfully* to validate a social psychological construct, there was little reason to continue using these relatively complex, expensive, and time-consuming procedures to investigate the construct because the validity of the construct had been established, at least to the extent possible using psychophysiological procedures. Therefore, the simpler, less expensive, and less time-consuming verbal or behavioral measures traditionally used by social psychologists had been exonerated as being just as informative. The important concept of residual arousal, for instance, has received wide acceptance and application within social psychology, but the construct validity of this important concept is based almost entirely on a single pilot study

reported by Cantor, Zillmann, and Bryant (1975), in which both self-report and physiological data were recorded (cf. Cacioppo, Tassinary, Stonebraker, & Petty, 1987).

The situation proved no better when the application of psychophysiological procedures *failed* to confirm the validity of a verbal measure of a social construct. Breckler (1984), for instance, argued that studies of the attitude tripartite should measure responses from a variety of domains, and in Experiment 1, he recorded heart rate as a measure of the "affective" component of attitudes. Analyses revealed that heart rate was unrelated to his other measures of the affective component. Having failed to confirm the expected link between heart rate and the "affective component" of attitudes, Breckler (1984) conducted a "verbal report analogue" (p. 1200) of his first experiment while deleting all physiological measures in the replication. The deletion of physiological measures produced a pattern of data more friendly to the tripartite conceptualization.

C. OPERATIONAL AND CONCEPTUAL DISCONFIRMABILITY

The empirical disconfirmation of a theoretical prediction can be attributable to a variety of factors, not the least of which is a suspect relation between psychophysiological data and the theoretical construct of interest. Indeed, the relation between social psychological theory and psychophysiological data have been and often continue to be criticized for: (1) naive or questionable operationalizations (e.g., heart rate as an index of affect); (2) inappropriate, artifactual, or insensitive measurement procedures (e.g., heart rate is under tight homeostatic control; the size of SRRs can be affected dramatically by the background level of skin resistance); and (3) naive or inappropriate interpretations (e.g., inferring evidence for general arousal when only one physiological response was monitored or when more than one response was monitored but only one showed significant or expected changes as a function of the treatment). Consequently, unexpected data in construct validation studies have led to the discrediting of the psychophysiological conceptualizations and/or procedures rather than of the theory itself.

The point is not to reify physiological responses, but rather to give them the same thought and attention that we give our verbal and behavioral measures. As when using verbal or behavioral measures, conceptual disconfirmability, and hence theoretical advances in understanding social behavior based on psychophysiological investigations, requires that the relation between concepts and operations first be established confidently (see Greenwald, Pratkanis, Leippe, & Baumgardner, 1986).

Having noted this, yet further hindrances become immediately obvious: (1) there is no apparent purpose in social psychologists learning about or using psychophysiological theory and techniques unless or until the links between psy-

chophysiological data and social psychological constructs have been clearly established; and (2) there is little incentive for psychophysiolgists to begin the arduous task of establishing these relationships when there is little interest in or audience for the effort.¹⁴ In the next section, we review evidence suggesting that these obstacles are neither peculiar nor inexorable.

VII. The New Look: Part III

Research on theoretical processes in social psychology ranging from the arousal of cognitive dissonance to the cue processing underlying the sleeper effect has traditionally relied on people's self-reports to assess the efficacy of the experimental manipulations, the effects of these manipulations on verbal and overt behavior, and the operation of the assumed intervening sequence of events. One feature of this research is that ingenious experimental designs have been employed to allow inferences to be drawn regarding the processes underlying these verbal and/or behavioral data. However, these inferences are themselves often followed by ingenious counterarguments and occasionally by theoretical impasses. The number of seemingly irreconcilable debates in social psychology has fueled concerns about the nature of the social sciences generally and social psychology in particular, including aspects of its stability, methodology, and epistemology (e.g., Gergen, 1973; Greenwald, 1975; McGuire, 1973, 1985).

These conditions might be thought sufficient to lead to the consideration, if not embracing, of alternative approaches. Not so, according to Kuhn (1970), who suggests that there is a strong resistance to new paradigms inherent in established disciplines. For instance, social psychological constructs are generally defined in a manner that capitalizes on the methodologies and measures most readily available, thereby maximizing their testability and influence—and minimizing the relevance of alternative domains of knowledge, such as psychophysiological concepts and procedures. Hence, theoretical constructs such as

¹⁴It is of interest to note that major figures in psychophysiology as well as in social psychology contributed unwittingly to this dilemma. We have already noted that Gordon Allport (1947) equated psychophysiology with simplistic, mechanistic thinking. A dozen years later, Lacey (1959) cogently criticized poorly controlled psychophysiological studies of psychotherapeutic interactions—social interactions of interest to psychophysiolgists of that day—and he called for more highly controlled investigations of psychophysiological measurement and relationships. Allport's influential presidential address and subsequent writings cast verbal reports in the starring role and cast psychophysiological concepts and measures as irrelevant to the study of social processes and behavior. Lacey's appeal, on the other hand, diminished the incentive for psychophysiolgists investigating relatively abstract and intractable social constructs and processes. It is perhaps understandable, therefore, why more was said about physiological factors and mechanisms in the original textbooks on social psychology than in contemporary textbooks and why more was said about social and cultural factors in the original texts in psychophysiology than in the texts that have appeared in the intervening two decades.

physiological arousal become conceptualized in attributional terms, and their influence on individual and group behavior is investigated primarily by using verbal reports and misattribution paradigms (cf. Lindzey & Aronson, 1985; Reizenstein, 1983).

In sum, analyses of the nature of scientific progress anticipates the resistance of established disciplines to new paradigms because, for instance, existing theories oftentimes make no clear predictions regarding these new measures. This is best viewed as an unintentional consequence of the best of scientific intentions (e.g., in the name of disconfirmability, parsimony).

A. EMPIRICAL ANOMALIES

The conflicting demands of avoiding a policy of immunizing perspectives against refutation while maintaining testable theories and not succumbing too easily before they have been able to make their contributions to the growth of science have long been recognized by philosophers of science. It is noteworthy in this context, however, that a key condition supporting the development of new or more complex perspectives is the observation of phenomena that cannot be assimilated easily into existing paradigms. The growth of systematic research on the relationships between social processes and psychophysiological measures or mechanisms, therefore, may be necessary but not sufficient to foster the consideration of the organism, as well as the individual, when studying social processes and behavior. Ultimately, the prospects for the growth within social psychology of a metatheoretical orientation, wherein there is an integrated consideration of the biopsychosocial aspects of mentation, emotion, and behavior, depends on the ability of this perspective to reveal and explain new and interesting phenomena. In our view, there are promising signs that such is the case.

Consider, for instance, that attitudes and emotions have traditionally been defined, at least within social psychology, in terms of what people report believing or feeling. Constructs such as "unconscious emotion," therefore, are a contradiction in terms, and clinical phenomena such as *prosopagnosia*—a neurological condition of individuals who are unable to recognize visually the faces of familiar persons, exhibiting large skin conductance responses (SCRs) to faces of persons they had previously known but were not able to recognize (Tranel & Damasio, 1985)—stand as empirical anomalies. So, too, do (1) studies on the effects of environmental noise during various sleep stages, which reveals that sleeping subjects exhibit subtle patterns of facial efference remarkably similar to those observed in waking subjects confronted by unpleasant stimuli (Sumitsuji, Nan'no, Kuwata, & Ohta, 1980); (2) studies showing that subtle adjustments of bodily response, such as head nodding (Wells & Petty, 1980) or transient and specific variations in heart rate (Cacioppo, 1979), can influence attitudes and persuasion; (3) studies showing that emotion can be characterized by specific rather than general and

diffuse physiological responses (e.g., Cacioppo, Petty, Losch, & Kim, 1986b; Ekam *et al.*, 1983); and (4) studies demonstrating physiological (Tassinary, Orr, Wolford, Napps, & Lanzetta, 1984) and behavioral (Greenwald, Klinger, & Liu, 1987) effects of the processing of emotionally laden words whose presentation cannot be reported.

Empirical anomalies within psychophysiology also exist which call for a consideration of social factors. For instance, there is now evidence for a moderating role of social factors (e.g., mere presence) on stimulus changes and physiological reactivity in studies of both autonomic (e.g., Fowles, Roberts, & Nagel, 1977; see, also, Moore & Baron, 1983) and somatic response systems (e.g., Ekman, 1972; Yarczower & Daruns, 1982); and for the role of social factors (e.g., position in a social hierarchy) on the relationship between physiological changes and behavior (e.g., Haber & Barchas, 1984; see, also, Zillmann, 1983).

B. A CHANGING ZEITGEIST

The social and political zeitgeist has also been more influential in social psychology than in many sciences, presumably because of the close relationship between social psychological interests and social events (Jones, 1985). It is significant, therefore, that a major development in Western societies over the past several years is the realization that the leading causes of disability and death (e.g., heart disease, cancer, accidents) have substantial social and behavioral components. The resulting emphasis on preventive medicine and on the social and behavioral factors related to public health has stimulated interest among social scientists in physiological concepts and techniques (e.g., Fleming, Baum, & Singer, 1984; Van Egeren, 1984). A second important consequence is that attention is being given to questions regarding (1) which, when, and how physiological mechanisms moderate the effect of social stimuli on individual action and experience; and (2) which, when, and how social factors and systems moderate the effect of environmental stimuli on physiological reactivity and disease.

Again, not only does psychophysiology have contributions to offer social psychology, but also theoretical principles that have emerged from analyses of social behavior can be used to extend our understanding of psychophysiological phenomena—such as how it is that people detect and interpret the signs (bodily changes detected through exteroceptive sensory channels) and symptoms (bodily changes detected through interoceptive or proprioceptive sensory channels) of disease (e.g., Cacioppo, Andersen, Turnquist, & Petty, 1986a; Leventhal, Meyer, & Nerenz, 1980).

As a case in point, consider one of the most eloquent of social psychological theories—social comparison theory. Although Festinger (1954) proposed his theory of social comparison to stipulate why individuals compared their own opinions and abilities with those of others, with whom these comparisons were

made, and with what effects these comparisons were made, this work served as the springboard for the next three decades of social psychological research on the problem of explicating the cognitive and emotional processes that are initiated by the detection of unexpected bodily events (e.g., see Riesenzein, 1983; Schachter, 1959; Schachter & Singer, 1962).

We have also drawn on this work to suggest that not only do people attempt to evaluate their abilities and opinions to achieve or maintain an explicable social condition, but they also actively evaluate their bodily signs and symptoms to achieve or maintain an explicable physiological condition. Specifically, it was noted that the process of social comparison typically involves comparing one's abilities and opinions with those of others, and it was proposed that the process of psychophysiological comparison typically involves comparison of signs and symptoms (1) that those individuals attribute to a situation or stimulus—or what could be termed "implicit stimulus response stereotypy"—and (2) that those individuals attribute to themselves—or what could be termed "implicit individual response stereotypy" (Cacioppo, 1983). We subsequently identified general principles governing the appraisals of individuals confronted with the signs and symptoms of disease (Cacioppo, Andersen, Turnquist, & Petty, 1986a; Cacioppo, Andersen, Turnquist, & Tassinary, in press). These principles, which are summarized in Table I, portray psychophysiological comparison processes as being pervasive, influential, and in many cases biased to support a positive view of oneself and one's physiological condition (see Table I).

A study of 54 women who had just been diagnosed as having gynecologic cancer provided an examination of several of these principles (Cacioppo, Andersen, Turnquist, & Petty, 1986a). Patients were interviewed individually within 36 hours of their admission to the hospital by an interviewer who was blind to the experimental hypotheses. The interviews, which were conducted prior to the onset of any medical treatment, inquired about the signs and symptoms patients noticed, their perceived causes for and interpretation of these bodily changes, their desire-motivation to seek further information about or treatment for the signs and symptoms, and so forth.

The results indicated that principles derived from social psychological analyses of behavior—such as the postulates of logical and hedonic consistency—provided pointers to, if not explanations for, patient decision making and delay. For instance, we found that patients tended to generate explanations for unexpected bodily changes according to prototyped conceptions they have of daily activities and physical diseases (see, also, Bishop & Converse, 1986; Leventhal *et al.*, 1980; Safer, Tharps, Jackson, & Leventhal, 1979). In addition, however, we found that the more innocuous the account generated initially for their signs and symptoms (e.g., normal life events, not cancer), the less their motivation to continue searching for an explanation, and the longer the delay in seeking appraisal.

Perhaps more important than the ultimate validity of the specific principles

TABLE I
PSYCHOPHYSIOLOGICAL COMPARISON PROCESSES

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1. People are motivated to maintain an explicable physiological condition.
 2. Symptoms are not necessarily either perceived as neutrally arousing or perceived accurately in terms of their physiological etiology.
 3. The strength of the motivation to understand and evaluate the symptoms is a function of their unexpectedness, salience, personal relevance, and perceived consequences.
 4. Symptom interpretation involves a comparison of the symptoms with the known consequences of salient contextual stimuli (e.g., pathogens, medication), and physiological conditions (e.g., fatigue, allergies, diseases—i.e., illness prototypes).
 5. Symptom interpretation is governed in part by logical consistency. For instance, the probability of a specific illness inference is a direct function of its accessibility and an inverse function of the discrepancy between the symptoms and the illness prototype.
 6. Symptom interpretation is governed in part by hedonic consistency. For instance, innocuous explanations (e.g., accounts depicting the symptoms as transient or self-correcting) more greatly diminish the individual's motivation to obtain an explicable physiological condition to a greater degree, *ceteris paribus*, than do highly threatening accounts.
 7. The more diffuse the symptoms, the greater the number of potential comparisons and, consequently, the greater the likelihood of erroneous interpretations of the symptoms and the more susceptible to change are these inferences.
 8. If an illness prototype cannot be identified initially that is believed to have effects similar to the detected bodily changes, then the prototype that maximizes the aforementioned logical and hedonic parameters will influence subsequent attention to and production and detection of the expected symptoms.
 9. If a comparison cannot be identified initially that is believed to have effects similar to the detected bodily changes, then the detected symptoms will influence the idiosyncratic physiological consequences attributed to the prototype that maximizes the aforementioned logical and hedonic parameters.
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outlined in Table I, however, is the suggestion from these and related approaches (e.g., Leventhal *et al.*; 1980; Matthews, Siegel, Kuller, Thompson, & Varat, 1983; Mechanic, 1972; Pennebaker, 1982) that a consideration of social, psychological, and physiological factors and knowledge domains need not result in reductionism but rather can lead to new, interesting, and integrative insights into human nature.

VIII. Conclusion

We have traced the transition of "social psychophysiology" from a reductionistic search for physiological invariants to an esoteric methodological tool for purposes of validating social psychological constructs to a metatheoretical orientation wherein there is a joint and integrative consideration of the inherent

biopsychosocial nature of mentation, emotion, and behavior. We argued that physiological measures can fruitfully be conceptualized as manifestations of processes invoked as part of an organismic-environmental transaction (see, also, Donchin, 1982). Such processes may or may not be part of psychological activity, and may or may not be responsive to or influential in human association and interaction. When measures within limited contexts are identified that are related to social psychological processes or events, the nature of the relationship may or may not be monotonic. When the functional relationship within the measurement context across these various levels of representation is found, it is of use to the extent that it is possible to address issues of theoretical import by employing psychophysiological measures as a source of data about the social organism. That is, the goal is not simply to catalog the physiological manifestations of social behavior.

We also noted that inferences regarding the presence or absence of a particular antecedent or process (e.g., arousal) based on a particular target physiological response (e.g., SCRs) can be misleading unless one also considers (1) the nature of the relationship between the psychological process or event of interest and the physiological response being measured (e.g., negatively evocative stimuli have often been found also to heighten SCR), (2) the likelihood of other factors within the measurement context eliciting the observed physiological response (e.g., SCR activity is heightened when individuals become startled, alerted, conflicted, ecstatic, warm, etc.), and (3) the likelihood that the antecedent of interest leads to something other than the target physiological response (e.g., mildly evocative negative stimuli may heighten activity over the brow region while failing to alter EDA).

Furthermore, although the assignment of psychological meaning to a physiological response does not depend logically on knowledge of the physiological mechanism underlying the response, the physiological basis of the responses of interest are often well articulated and can contribute to psychometric and social psychological inquiries by its: (1) intimation or stimulation of theory and operationalizations; (2) discrimination of signal from artifact; (3) provision for safety of the individuals involved; (4) stipulations for the acquisition and analysis of digital arrays and descriptive parameters that are reliable and valid representations of the physiological events of interest; and (5) guidance of feasible inferences based on physiological data.

Illustrative research was reviewed demonstrating the use of facial EMG to help track the means by which the social world impinges on individual action and experience in studies ranging from self-referent processing to self-disclosure to communication and persuasion. However, given the inherent resistance of established disciplines to new paradigms (e.g., because in the service of parsimony and disconfirmability, theories within a discipline often make no clear predictions regarding new domains) the growth of systematic research on the relationships between social processes and psychophysiological data is necessary but not suf-

ficient to foster our considering the organism as well as the individual when studying social processes and behavior. Ultimately, therefore, the prospects for a social psychophysiological approach to human nature depend on its ability to uncover and explain new and interesting phenomena. Promising signs were reviewed that just such a circumstance might be developing.

Finally, it was noted that the social and political zeitgeists have been more influential in social psychology than in many other sciences, understandably, as Jones (1985) argues, because many of the phenomena of interest and in dire need of explanation are played out in the social and political arena (e.g., Latane & Darley, 1970; Milgram, 1963). The recent realization that the leading causes of disability and death in Western civilization have substantial social and behavioral components, and the emergence of interest and research on the social and behavioral factors related to public health, are therefore significant. These developments have stimulated interest among social psychologists not only in physiological concepts and techniques, but also in questions regarding which, when, and how physiological mechanisms moderate the effect of social stimuli on individual action, experience, and health. The long tradition of basic research and theory within social psychology is serving this emerging zeitgeist well, as social psychological principles are providing an important legacy for health as well as for psychophysiological research.

Acknowledgments

This article is based on an invited address delivered by J. T. Cacioppo at the annual meeting of the American Psychological Association, Washington, DC, 1986. The research cited in, and preparation of, the address and article were supported by National Science Foundation Grant Nos. BNS-8444909 and BNS-8517658.

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