

A CYBERNETIC THEORY OF STRESS, COPING, AND WELL-BEING IN ORGANIZATIONS

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Many major theories of organizational stress (OS) reflect basic principles of cybernetics, most notably the negative feedback loop. However, these principles are rarely examined in empirical OS research, which focuses predominantly on simple bivariate relationships embedded in OS theories. This problem may reflect an implicit rejection of cybernetic principles on conceptual grounds, the absence of specific propositions regarding these principles, methodological difficulties, or some combination of these factors. In any case, the result is a gap between theoretical and empirical OS research, which severely hinders the accumulation of knowledge in this area. This article is intended to narrow this gap by presenting an integrative cybernetic theory of stress, coping, and well-being in organizations, deriving propositions from this theory, and discussing methodological issues in testing this theory.

Cybernetics, or control theory, is becoming widely accepted as a general theoretical framework for understanding human behavior. In brief, cybernetics concerns the functioning of self-regulating systems (Ashby, 1966; Wiener, 1948). At its core is the negative feedback loop, which acts to minimize (i.e., negate) discrepancies between environmental characteristics and relevant reference criteria. The principles of cybernetics have been applied to general theories of human behavior (Carver & Scheier, 1981, 1982; Miller, 1965; Powers, 1973) and mental and physical health (Hyland, 1987; Leventhal, Nerenz, & Strauss, 1980; Pyszczynski & Greenberg, 1987; Schwartz, 1983), as well as theories in the organizational behavior (OB) literature, such as motivation (Klein, 1989; Taylor, Fisher, & Ilgen, 1984), goal setting (Campion & Lord, 1982), absenteeism (Rosse & Miller, 1984), performance appraisal (Campbell & Lee, 1988), self-leadership (Manz, 1986), and resource dependence (Green & Welsh, 1988).

Though rarely emphasized, certain cybernetic principles, most notably the negative feedback loop, are also evident in current theories of organizational stress (OS) (e.g., Beehr & Newman, 1978; Cummings & Cooper,

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1979; French, Caplan, & Harrison, 1982; Kahn, Wolfe, Quinn, Snoeck, & Rosenthal, 1964; McGrath, 1976; Newman & Beehr, 1979, Schuler, 1980) These theories improve upon simpler (i.e., recursive) models by emphasizing that stress not only damages health but also stimulates coping, which, in turn, influences the determinants of stress (Edwards, 1988). Despite this advantage, most empirical studies have overlooked cybernetic principles, focusing instead on simple bivariate relationships (Beehr & Newman, 1978; Cooper & Marshall, 1976, Jackson & Schuler, 1985). This problem may reflect an implicit rejection of cybernetic principles as represented in current OS theories, the absence of specific propositions regarding these principles, methodological difficulties, or some combination of these factors. In any case, the result is a gap between theoretical and empirical OS research, which severely hinders the accumulation of knowledge in this important area of investigation.

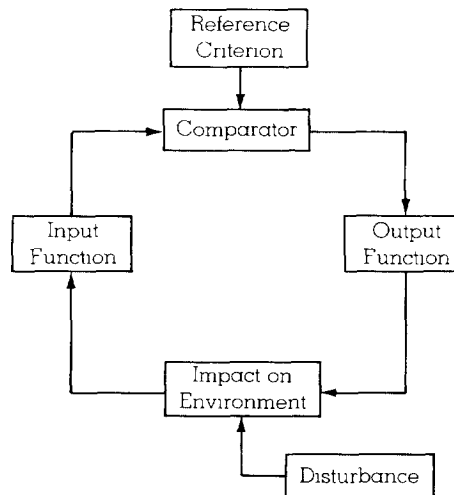
This article attempts to narrow the gap between theoretical and empirical OS research by presenting a cybernetic theory of stress, coping, and well-being in organizations. This theory integrates and extends existing OS theories by more fully incorporating principles from cybernetic theory and showing their conceptual relevance to OS research. This article also derives propositions from the proposed theory and discusses methodological issues in testing the theory. This combination should yield research that explicitly tests the cybernetic principles in the proposed theory, yielding a theoretical and empirical correspondence lacking in much OS research.

FUNDAMENTAL PRINCIPLES OF CYBERNETICS

As stated, cybernetics concerns the functioning of self-regulating systems. At its core is the negative feedback loop, the basic unit of cybernetic control. The operation of the negative feedback loop is perhaps best understood by sequentially considering its basic components. As indicated in Figure 1, the input function senses the environment and transmits this signal to the comparator, which evaluates the sensed environment against a relevant reference criterion. If this comparison indicates a discrepancy between the sensed environment and the reference criterion, the output function attempts to alter the environment to reduce or eliminate the discrepancy. This process may be initiated by a disturbance in the environment or a change in the reference criterion, either of which can create a discrepancy and activate the output function. Most discussions of cybernetic theory elaborate this basic framework to include effects of the output function on the reference criterion (Campion & Lord, 1982) and causal relationships and hierarchical arrangements among multiple feedback loops (Carver & Scheier, 1981, 1982; Powers, 1973).

Though the processes just described may seem rather mechanical, their parallels with human behavior in organizations are rather straightforward. For example, comparing the sensed environment against a reference criterion corresponds to evaluating perceived organizational attributes

FIGURE 1
The Negative Feedback Loop^a



^a Adapted from "Control Theory: A Useful Conceptual Framework for Personality – Social, Clinical, and Health Psychology" by C. S. Carver and M. F. Scheier, 1982, *Psychological Bulletin*, 92, 112. Copyright 1982 by the American Psychological Association. Reprinted by permission.

against relevant standards. Similarly, the effects of the comparator on the output function represent the motivational properties of discrepancies between current status and desired end states (e.g., goals). Likewise, the effects of the output function on the environment represent attempts to change the organization and, hence, resolve perceived discrepancies. As indicated previously, these parallels have been elaborated in various areas of the OB literature, including goal setting, motivation, absenteeism, and performance appraisal. The following discussion focuses specifically on applications in the OS literature.

EVIDENCE OF CYBERNETICS IN CURRENT OS THEORIES

As previously indicated, principles of cybernetics, particularly the negative feedback loop, are evident in numerous OS theories. Of these, four are widely cited and represent the larger population of OS models (Eulberg, Weekley, & Bhagat, 1988). These include role stress theory (Kahn et al., 1964), McGrath's (1976) stress cycle, Beehr and Newman's (1978) facet model, and person-environment (P-E) fit theory (French et al., 1982). Though these theories have been widely discussed, their underlying cybernetic principles are rarely mentioned, perhaps because they were not explicitly stated as such. Though less widely cited, the Cummings and Cooper (1979) framework is also noteworthy because it applies cybernetics more explicitly than any other OS theory to date. Finally, Lazarus's transactional model

(Lazarus, 1966; Lazarus & Folkman, 1984) should be considered. Even though this model has received limited attention in the OS literature, it has greatly influenced the larger domain of stress research and, like the preceding theories, reflects cybernetic principles.

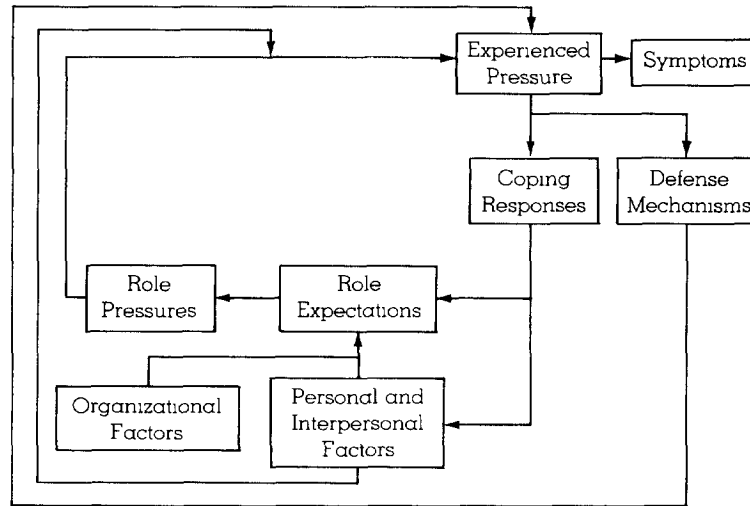
The six theories just cited are depicted in Figure 2, which explicitly portrays their implied cybernetic processes. Consistent with Figure 1, the components of each theory are positioned such that the environment is at the bottom, perceptual processes are toward the left, cognitive appraisal processes are at the top, and well-being and coping responses are toward the right. The following discussion will briefly summarize and compare these theories.

Two issues should be noted before this discussion. First, these theories are far more complex than implied by this brief summary. Nonetheless, this summary is sufficient to identify and compare how these theories incorporate basic cybernetic principles. Second, many of the boxes in Figure 2 do not represent single constructs, but rather collections of constructs. This is particularly true for Beehr and Newman's (1978) model, where each box represents multiple facets in OS research. Therefore, the models in Figure 2 should be considered heuristic rather than structural, and empirical tests of these models would require unidimensional measurement of one or more constructs included in each box. These and other methodological issues in testing cybernetic OS models are elaborated in a later section of this article.

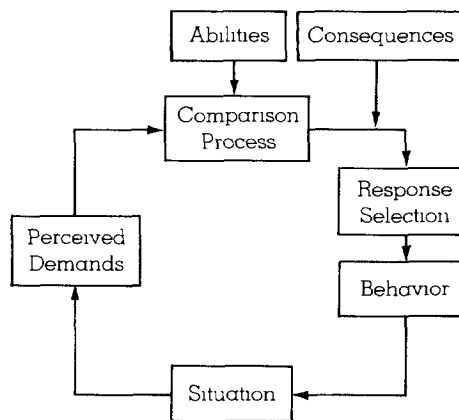
Role stress theory (Kahn et al., 1964) was the first major OS theory to incorporate feedback mechanisms. This theory states that organizational factors generate role expectations among role senders, who then transmit these expectations as role pressures to the focal person. These pressures interact with the personality of the focal person and with interpersonal factors, yielding experienced pressure (e.g., role ambiguity, role conflict). Experienced pressure creates symptoms of ill health and activates defense mechanisms and coping responses. Defense mechanisms are attempts to distort the ambiguity or conflict in sent role pressures, reducing experienced pressure without actually altering the situation. Coping responses include efforts to comply with role pressures, to modify incompatible demands, or to avoid the situation. Coping may influence role expectations either directly or through personal and interpersonal factors, or may moderate the effects of sent role pressures on experienced pressure by modifying personal and interpersonal factors.

The stress cycle described by McGrath (1976) indicates that the employee appraises situational demands against his or her abilities. If these demands threaten to exceed abilities, and failure to meet the demands entails substantial costs, the employee will select and implement a behavioral response intended to improve the situation. McGrath (1976) extended this basic framework to include multiple feedback loops across several interrelated systems, arguing that effective coping requires correspondence among situational demands, perceived demands, response selection, and behavior within each system.

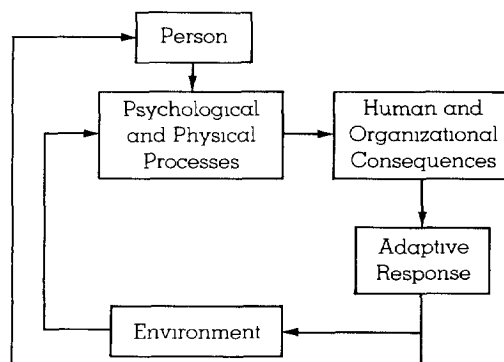
FIGURE 2
Major Theories of Organizational Stress That Incorporate Cybernetic Principles



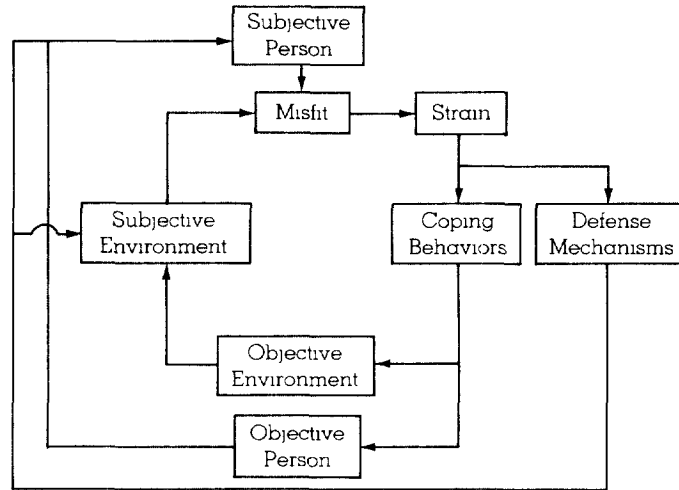
Kahn, Wolfe, Quinn, Snoeck, and Rosenthal, 1964



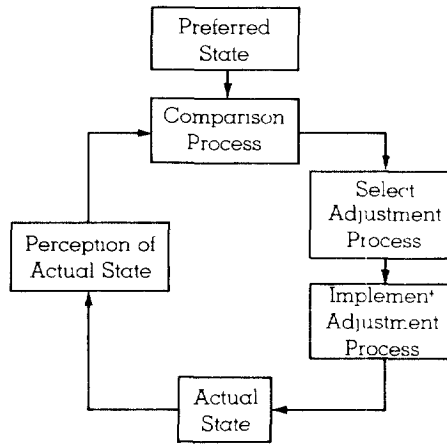
McGrath, 1976



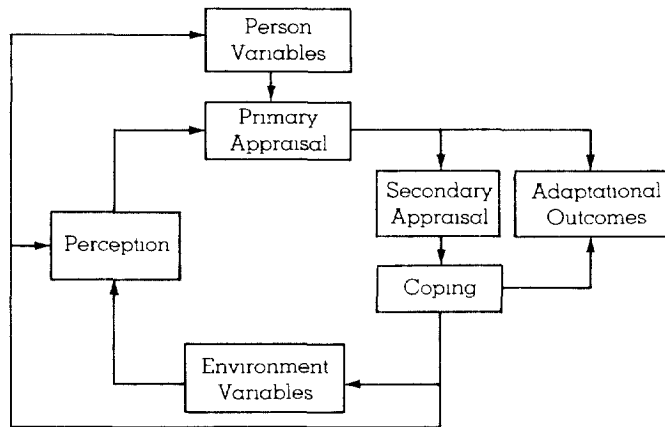
Beehr and Newman, 1978



French, Caplan, & Harrison, 1982



Cummings and Cooper, 1979



Lazarus and Folkman, 1984

The facet model presented by Beehr and Newman (1978) asserts that characteristics of the person and environment are filtered through psychological and physical processes. These processes influence employee health and organizational effectiveness, which, in turn, generate adaptive responses directed toward the person and the environment. Beehr and Newman (1978) also included a time facet, emphasizing that each link in the model requires the passage of time. Newman and Beehr (1979) presented a slightly augmented version of this model, in which personal and situational characteristics moderate each relationship between components of the model, and in which coping responses may have additional direct effects on employee health and organizational effectiveness, thus bypassing the person and environment.

P-E fit theory (French et al., 1982) posits that objective characteristics of the person (abilities and goals) and the environment (job demands and supplies) influence the employee's perceptions of those characteristics. If these perceptions indicate subjective misfit between the person's abilities and goals and the corresponding job demands and supplies, then psychological, physiological, and behavioral strains result. These strains initiate coping behaviors and defense mechanisms, with coping behaviors directed toward the objective person and environment, and defense mechanisms directed toward the subjective person and environment.

The Cummings and Cooper (1979) framework indicates that a discrepancy between a preferred and an actual state causes the employee to select and implement adjustment processes intended to alter the situation and resolve the discrepancy. Similar to McGrath (1976), Cummings and Cooper (1979) described multiple interrelated feedback cycles, but further contended that these cycles are arranged hierarchically, with greater coping effort directed toward discrepancies involving higher ranked preferences. Cummings and Cooper (1979) also emphasized that the feedback process is dynamic, with variations in coping as the situation changes over time.

Lazarus's transactional model (e.g., Lazarus & Folkman, 1984) indicates that person variables (i.e., beliefs, goals, values, commitments) interact with environment variables (i.e., demands, constraints, resources) through a cognitive process termed *primary appraisal*. If the environment is appraised as taxing or exceeding the person's resources and endangering his or her well-being, coping is activated. Coping involves determining what can be done (i.e., secondary appraisal) and, subsequently, attempting to alter the troubled person-environment relationship (i.e., problem-focused coping) and/or to regulate emotional distress (i.e., emotion-focused coping). The situation is then reappraised, and the process continues. If the encounter is successfully resolved, coping ceases and positive affect results. Otherwise, negative affect and physiological disturbances persist, ultimately damaging adaptational outcomes (i.e., psychological well-being, somatic health, social functioning). Lazarus and Folkman (1984) also emphasized that appraisal and coping occur across multiple dimensions, and that suc-

cessfully resolving an encounter on one dimension depends on the degree of conflict created on other dimensions

These six theories share the common feature of the negative feedback loop, which links coping to the determinants of stress. Despite this similarity, these theories are inconsistent on several important points. First, different reference criteria are used; some theories focus on preferences (Cummings & Cooper, 1979), others focus on abilities (Kahn et al., 1964, McGrath, 1976), and others focus on both (French et al., 1982, Lazarus & Folkman, 1984; Newmcn & Beehr, 1978). Second, symptoms of ill health are explicitly included in some theories (Beehr & Newman, 1978; French et al., 1982, Kahn et al., 1964; Lazarus & Folkman, 1984) but not in other theories (Cummings & Cooper, 1979, McGrath, 1976). Third, the relationship between stress and coping is direct in some theories (Cummings & Cooper, 1979; Kahn et al., 1964; Lazarus & Folkman, 1984, McGrath, 1976) and mediated by symptoms of ill health in other theories (Beehr & Newman, 1978; French et al., 1982). Fourth, coping is directed exclusively at the environment in some theories (Cummings & Cooper, 1979; McGrath, 1976) and at both the person and environment in other theories (Beehr & Newman, 1978; French et al., 1982; Kahn et al., 1964; Lazarus & Folkman, 1984). Finally, multiple interrelated feedback loops are included in some theories (Cummings & Cooper, 1979, Lazarus & Folkman, 1984; McGrath, 1976) but not other theories (Beehr & Newman, 1978, French et al., 1982; Kahn et al., 1964)

These inconsistencies create several dilemmas for the OS researcher. First, it is logically impossible to adopt one theory without simultaneously challenging the premises of the others. Second, the relative merits of the premises underlying these inconsistencies have not been discussed in the OS literature. Third, empirical evidence regarding these theories cannot be fully integrated, thereby hindering the accumulation of knowledge in OS research. The proposed theory attempts to overcome these dilemmas by providing a general conceptual framework that resolves the inconsistencies among the theories reviewed while preserving their important strengths.

THE PROPOSED THEORY

Before the proposed theory is described, its key components will be defined. Briefly, this theory defines *stress* as *a discrepancy between an employee's perceived state and desired state, provided that the presence of this discrepancy is considered important by the employee*. Stress is hypothesized to influence two classes of outcomes. One class includes dimensions of *psychological and physical health* which, taken together, constitute *employee well-being*. The second class consists of *coping*, defined as *efforts to prevent or reduce the negative effects of stress on well-being*. Coping may influence well-being directly or by altering the determinants of stress (i.e., the perceived and desired states involved in the discrepancy and/or the amount of importance associated with the discrepancy). Thus, stress, cop-

ing, and well-being are critical components of a negative feedback loop, where stress damages well-being and activates coping, which, in turn, influences well-being both directly and indirectly through the determinants of stress.

Given the ongoing controversy surrounding the definition of stress (Parker & DeCotiis, 1983), three points regarding the definition presented here should be noted. First, this definition is relational, characterizing stress not as an aspect of either the employee or the work environment but, instead, as a relationship between the two (cf. Lazarus & Folkman, 1984; Shirom, 1982). Relational definitions of stress may be contrasted with stimulus definitions, in which stress is viewed as some aspect of the environment that damages employee well-being (e.g., Cooper & Marshall, 1976; Kahn & Quinn, 1970; Matteson & Ivancevich, 1979). Stimulus definitions have several limitations, such as overlooking individual differences in the appraisal of the environment (Lazarus, 1966; McGrath, 1970) and an inherent circularity, in that the environment is not defined as stressful without simultaneously considering the reactions of the employee (Lazarus & Folkman, 1984). Relational definitions also may be contrasted with response definitions, in which stress is viewed as a deviation from normal psychological or physiological functioning (e.g., Ivancevich & Matteson, 1980; Parker & DeCotiis, 1983; Selye, 1956). Response definitions also suffer from several weaknesses, such as classifying responses as stressful without regard to their psychological precursors and surrounding context (McGrath, 1970), and overlooking situations where employees exhibit minimal symptoms due to effective coping (Lazarus & Folkman, 1984). The weaknesses in stimulus and response definitions of stress are avoided by relational definitions, which have gained increasing favor in recent years (Eulberg et al., 1988; Schuler, 1980).

Second, this definition views stress as a relationship between employee perceptions and desires (Cummings & Cooper, 1979; Schuler, 1980). This view may be contrasted with definitions involving the relationship between job demands and employee abilities (e.g., Cox, 1978; Karasek, 1979; McGrath, 1976; Sells, 1970; Shirom, 1982). Although these definitions seem inconsistent, Harrison (1978) argued that situations in which demands exceed abilities produce stress only if meeting those demands will yield desired outcomes, or if the employee views meeting the demands as inherently desirable (White, 1959). For example, a mechanic who lacks the abilities needed to repair a machine will experience stress only if a successful repair will yield valued rewards (e.g., pay, time off), or if the mechanic inherently desires to successfully repair the machine. Hence, a gap between demands and abilities will produce stress only if it implicitly involves a discrepancy between perceptions and desires. Thus, the present theory defines stress explicitly as a discrepancy between perceptions and desires. Discrepancies between demands and abilities are more appropriately viewed as predictors of coping efficacy, such that a coping strategy is more

likely to succeed when the demands of implementing that strategy are within the employee's abilities (Edwards, 1988).

Third, this definition is conceptually similar to most definitions of job satisfaction. For example, Locke (1976, 1984) defined job satisfaction as a positive emotional state resulting from the appraisal of the job as fulfilling one's job values (see also Lawler, 1973, Naylor, Pritchard, & Ilgen, 1980). This appraisal process is essentially the same as the comparison of perceptions to desires in the definition of stress presented here. However, as Locke's definition clearly states, this appraisal does not *define* job satisfaction, but instead *causes* job satisfaction, which itself represents a resulting emotional state (a component of psychological well-being in the present theory). Thus, stress and job satisfaction are not redundant, but are causally related, such that increases in stress will decrease job satisfaction (Beehr & Newman, 1978; Cooper & Marshall, 1976, Edwards, 1991).

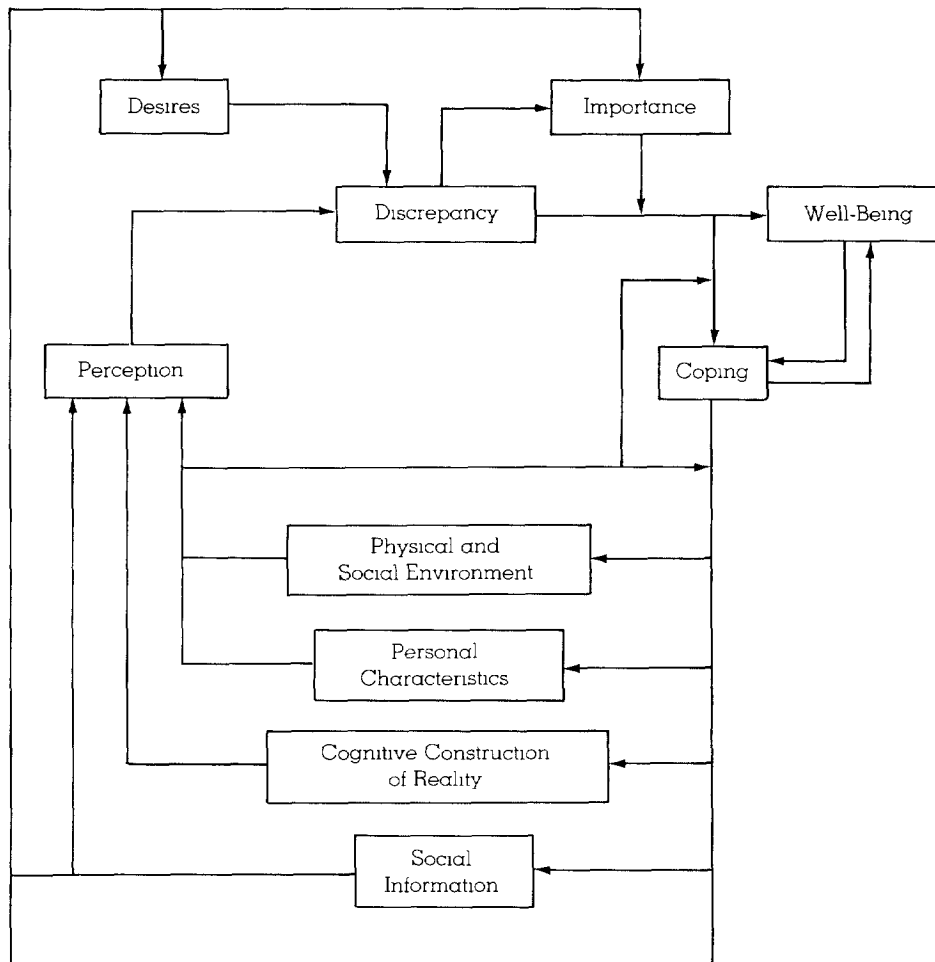
The conceptual overlap between stress and job satisfaction is not simply an artifact of the present theory; rather it has been implicit in these literatures for decades (French & Kahn, 1962; Locke, 1969). This overlap provides several untapped opportunities for integrating these literatures. For example, though physical health is central to OS research, it has been largely ignored in job satisfaction research. Conversely, OS research has emphasized *negative affect*, whereas job satisfaction research places equal emphasis on positive and negative affect. Scattered evidence indicates that positive affect (e.g., job satisfaction) may improve physical health (Edwards & Cooper, 1988; Karasek, Russell, & Theorell, 1982, Locke, 1976). This relationship may be more fully examined by including measures of physical health in job satisfaction research and measures of positive affect in OS research. Furthermore, with the exception of behavioral withdrawal (e.g., absenteeism, turnover), responses to job dissatisfaction have not been extensively examined. According to Locke (1976, 1984), these responses may also include direct attempts to modify the source of dissatisfaction, cognitive reappraisal, perceptual distortion, and other reactions that correspond very closely to dimensions of coping (Edwards, 1988, Lazarus & Folkman, 1984). Thus, merging the OS and job satisfaction literatures may yield a more complete and parsimonious framework for studying attitudes, behavior, and well-being in organizations.

The theory put forth in this article is depicted in Figure 3. The following discussion is organized according to the basic components of the theory, starting with perceptions and moving clockwise through the model.

Perceptions

Because the present theory focuses on the psychological mechanisms that mediate the effects of the environment and well-being, perceptual processes play a key role. *Perceptions* are defined as *the nonevaluative subjective representation of any situation, condition, or event*. In other words, perceptions refer to the subjective representation of how things are, rather

FIGURE 3
A Cybernetic Model of Stress, Coping, and Well-Being in Organizations



than how they *ought* to be (Beehr & Newman, 1978). According to the theory, factors in the work environment can produce stress only if the employee is subjectively aware of them (House, 1974; Kahn et al., 1964). This focus refers not to the type of variables included in the model, but to how they are interpreted by the employee (Lazarus & Folkman, 1984; McGrath, 1976). For example, the impacts of physical agents, such as noise and hazardous working conditions, are not excluded, but are considered in terms of how they are perceived and appraised by the employee.

Figure 3 indicates that perceptions are influenced by three classes of variables. The first consists of the *physical and social environment* and the employee's *personal characteristics*. The physical environment includes objective features of the employee's surroundings, such as working conditions

and geographic location, whereas the social environment involves the people, interpersonal relationships, and social arrangements in the employee's social milieu. Personal characteristics refer to the employee's own attributes, such as skills, abilities, and physical appearance. Both the physical and social environment and the employee's personal characteristics are filtered by perceptual processes, yielding a distorted and simplified subjective representation of reality (Allport, 1955; Neisser, 1976)

The theory presented here includes two additional determinants of perceptions typically excluded from OS theories. The first is *social information*, meaning the behaviors, opinions, and beliefs of others in the employee's social environment (Salancik & Pfeffer, 1978). Employees are more likely to rely on social information when physical evidence is lacking, when social cues are particularly salient, or when the sources of social information are considered credible or similar to the employee (Blau & Katerberg, 1982; Salancik & Pfeffer, 1978). The second is the employee's own *cognitive construction of reality*, which means that the employee does not passively receive external stimuli but, instead, actively constructs his or her own subjective reality, screening and selecting from available information (Neisser, 1976; Weick, 1979). When information is ambiguous or unavailable, the employee will compensate by cognitively constructing his or her own subjective reality (Salancik & Pfeffer, 1978; Weick, 1979).

Employees also may influence their subjective reality by focusing on situations that are not physically present. For example, an employee may dwell on job insecurity while processing paperwork, attending meetings, and so on, leading to stress which is not contingent on the tasks at hand (cf. Gardner, Dunham, Cummings, & Pierce, 1987; Greenhaus & Parasuraman, 1987). Similarly, an employee may experience stress by recalling the past or anticipating the future (Caplan, 1983; Cummings & Cooper, 1979; Hyland, 1988). For example, an employee may ruminate over a failure to attain a desired promotion or worry about a possible reorganization (Beehr & Newman, 1978; Cooper & Marshall, 1976). Thus, the employee may experience stress by focusing on situations that are removed in both place and time.

Desires

The theory presented here asserts that an employee's perceptions are evaluated against his or her desires. *Desires* refer to *any state or condition the employee consciously wants*. Desires may involve specific optimal amounts, ranges of acceptability, or minimum or maximum acceptable levels (Cummings & Cooper, 1979; French et al., 1982; Lord & Hanges, 1987). As defined here, desires are analogous to goals, values, and interests, in that each connotes a conscious preference for some state. However, goals imply action directed toward their attainment (Locke, Shaw, Saari, & Latham, 1981), whereas desires do not necessarily imply such action (Hamner, Ross, & Staw, 1978). Furthermore, values are typically described as global and enduring (Lofquist & Dawis, 1978), and interests are often considered spe-

cific and less stable (Rokeach, 1973; Super, 1973), whereas desires may vary considerably in their specificity and permanence. Hence, desires are viewed as broader than goals, values, and interests, subsuming these constructs under a more general term.

Though desires overlap conceptually with goals, values, and interests, they are distinct from other related concepts such as needs and expectations. Unlike needs, which refer to the biological requirements of an organism, desires may involve preferences for conditions or states that are not necessary, or even beneficial, for survival. Furthermore, needs function unconsciously, whereas desires involve conscious preferences (Locke, 1976). Finally, needs are innate, whereas desires are learned (Locke, 1976). Despite these distinctions, desires and needs may be causally related, as when hunger stimulates a conscious desire to eat, or when the desire to try an addictive substance develops into a physiological need for that substance. Desires also differ from expectations, which are beliefs concerning the future (Locke, 1976). Though desires and expectations may be related, in that employees often want only what they can reasonably expect to attain (Rosenberg, 1957), and may inherently desire to confirm their expectations (Weaver & Brickman, 1974), many expected events, such as a coming demotion or job termination, are considered undesirable by most employees. Hence, deviations from needs are stressful only if those needs are consciously desired, and deviations from expectations are stressful only if the expected state, or the mere confirmation of expectations, is considered desirable.

The present theory incorporates four primary determinants of desires. One determinant is early life experiences, which influence desires through episodes of pleasure and pain, and through attitudes and beliefs expressed by influential others (Bandura, 1977; McClelland, 1961, Taylor et al., 1984). Because these factors operate primarily during early life (i.e., before employment), they are not explicitly represented in Figure 3. A second determinant is social information, which provides cues regarding appropriate and relevant desires within a given work context (Campion & Lord, 1982; Carver & Scheier, 1981, Kahn et al., 1964; Salancik & Pfeffer, 1978). A third determinant is coping, which may involve adjusting desires toward perceptions to reduce stress (Beehr & Newman, 1978, Campion & Lord, 1982, Hamner et al., 1978). The fourth determinant involves the hierarchical arrangement of multiple feedback loops maintained by the employee. Through this hierarchy, discrepancies involving superordinate desires activate subordinate desires, and attaining subordinate desires fulfills superordinate desires (Carver & Scheier, 1981, 1982, Powers, 1973). The latter two determinants of desires are elaborated in later sections of this article, where coping and the interrelationships among multiple feedback loops are discussed.

The Discrepancy Between Perceptions and Desires

As noted previously, stress is defined as a discrepancy between perceptions and desires. Three important points regarding this discrepancy

should be noted. First, though discrepancies may occasionally involve mechanical subtraction, as when perceptions and desires are easily quantified (e.g., salary), they more often involve general, intuitive assessments of the degree to which perceptions deviate from desires (Kahn, 1970, Klein, 1989; Lord & Hanges, 1987, Taylor et al., 1984). Second, comparing perceptions to desires may range from a conscious cognitive process to an almost automatic appraisal (Lazarus & Folkman, 1984, Locke, 1984). Conscious comparison is more likely when self-focus is high, when the situation is novel, when perceptions are drastically incongruent with desires, when the associated discrepancy is particularly important, or when others cue the employee to engage in conscious comparisons (Carver & Scheier, 1981, Klein, 1989, Taylor et al., 1984). Third, the frequency with which perceptions are compared to desires will vary, with greater frequency when self-focus is high, when ability to resolve the discrepancy is uncertain, or when the discrepancy is considered particularly important (Taylor et al., 1984).

Importance

The definition of stress presented here refers to discrepancies between perceptions and desires that are considered *important* by the employee (Beehr & Bhagat, 1985, Schuler, 1980). *Importance* refers to the degree to which the employee views a discrepancy as central to his or her overall well-being. Importance operates as a moderator, such that higher levels of importance yield stronger relationships between discrepancies and outcomes, including both well-being and coping (Janis & Mann, 1977, Klein, 1989, Locke, 1969; McGrath, 1976, Mobley & Locke, 1970, Rice, McFarlin, Hunt, & Near, 1985, Taylor et al., 1984).

Several researchers have criticized importance as a moderator in the prediction of affect, particularly job satisfaction, based on evidence that weighting facet satisfaction with importance does not increase the variance explained in overall satisfaction (Blood, 1971, Ewen, 1967, Khaleque & Rahman, 1987; Mikes & Hulin, 1968, Quinn & Mangione, 1973). However, Mobley and Locke (1970) indicated that facet satisfaction already includes the moderating effect of importance, because facet satisfaction is determined by the discrepancy between perceptions and values weighted by value importance. Therefore, weighting facet satisfaction with importance merely introduces redundant information and, therefore, should not improve its predictive power. However, when importance is used to weight the discrepancy itself, the prediction of *facet* satisfaction is typically improved (Evans, 1969, Locke, 1969; McFarlin & Rice, In press, Mobley & Locke, 1970). For these reasons, the present theory asserts that importance moderates the effects of the discrepancy itself, *not* the outcomes of the discrepancy.

The present theory includes five primary determinants of importance. The first involves factors outside the model, such as socialization and early life experience, which cause employees to associate greater significance with attaining certain job-related desires. The second is social information (Salancik & Pfeffer, 1978), which may convince the employee that certain

discrepancies are more critical than others. The third is the magnitude of the discrepancy itself, such that larger discrepancies are considered more important (Maslow, 1954). For example, a superior may view a discrepancy between perceived and desired subordinate performance as more important when performance is far below standards than when performance is only slightly below standards. The fourth is coping, which may involve devaluing the importance of a discrepancy (Lazarus & Folkman, 1984, Schuler, 1985, Sherwood, 1965). The fifth involves causal relationships between multiple discrepancies, such that a discrepancy will be considered more important when it invokes other discrepancies. For example, a discrepancy between the perceived and desired number of publications is often important to a professor, because this discrepancy may influence discrepancies regarding promotion, tenure, salary, and so on. The effects of coping on importance and the causal relations among multiple discrepancies are elaborated in later sections of this article.

Well-Being

As indicated previously, stress is hypothesized to affect two classes of outcomes, including well-being and coping. *Well-being* refers to the *psychological and physical health of the employee*. Psychological well-being may range from subtle variations in mood and affect to substantial changes in mental health, such as chronic anxiety and clinical depression. Similarly, physical well-being may range from minor variations in arousal, such as blood pressure and heart rate, to the development of coronary heart disease (CHD), cancer, and so on. The use of discrepancies between perceptions and desires as predictors of well-being is evident in theories of job satisfaction (Lawler, 1973, Locke, 1976, 1984; Naylor et al., 1980; Rice et al., 1985), affect (Diener, 1984), depression (Hyland, 1987; Pyszczynski & Greenberg, 1987), and CHD (House, 1974; Matteson & Ivancevich, 1979).

The expected form of the relationship between a discrepancy and well-being depends on the nature of the desire involved. For desires that represent optima, discrepancies that are either positive (i.e., perceiving more than desired) or negative (i.e., perceiving less than desired) will damage well-being. Desires that represent ranges of acceptability will yield similar effects, provided that perceptions deviate beyond the acceptable range. For desires that represent minima, negative discrepancies will damage well-being and positive discrepancies will slightly improve well-being, whereas for desires that represent maxima, positive discrepancies will damage well-being and negative discrepancies will slightly improve well-being (French et al., 1982, Klein, 1989; Kulka, 1979; Locke, Cartledge, & Knerr, 1970, Rice et al., 1985).

The relationship between discrepancies and well-being also depends on the index of well-being considered. For indexes susceptible to rapid, transient shifts, such as mood and arousal, the effects of discrepancies will occur almost instantaneously and usually will dissipate when the discrepancy is resolved. However, for indexes representing degenerative disease,

such as cancer and CHD, the effects of discrepancies may take years to manifest themselves, will emerge only when discrepancies persist, and may remain, even if discrepancies are resolved

Coping

The second class of outcomes influenced by stress consists of *coping*, or *efforts to prevent or reduce the negative effects of stress on well-being*. There are two paths by which stress may influence coping (see Figure 3). First, stress may activate coping directly, in anticipation of potential damage to well-being (Cummings & Cooper, 1979; Kahn et al., 1964; Lazarus & Folkman, 1984; McGrath, 1976). Second, stress may activate coping indirectly through well-being, after well-being has been damaged (Beehr & Newman, 1978; French et al., 1982; Lazarus & Folkman, 1984).

Whether activated directly or indirectly, the coping process involves selecting and implementing various strategies intended to reduce stress and improve well-being (Edwards, 1988). This process may vary from controlled, conscious decision making to a virtually unconscious scripted response (Lord & Kernan, 1987). Conscious processing is more likely when situations are novel or ambiguous (Gioia & Poole, 1984; Lazarus & Folkman, 1984; Lord & Kernan, 1987), when coping efforts are obstructed (Lord & Kernan, 1987; Scheier & Carver, 1988), when the discrepancy is either rather large or important (Billings & Scherer, 1988; Hamburg & Adams, 1967; Lord & Kernan, 1987; Weiss, Ilgen, & Sharbaugh, 1982), when time pressure is low (Janis & Mann, 1977; Lazarus & Launier, 1978), when coping strategies being considered entail high monetary or psychological costs (Edwards, 1988), or when the employee is highly intelligent or particularly skilled in problem solving (Schuler, 1985).

There are four major mechanisms by which coping may reduce stress and improve well-being. Three of these mechanisms involve changing the core components of stress (i.e., the perceptions and desires involved in the discrepancy and/or the amount of importance associated with the discrepancy). Coping affects perceptions by altering the physical and social environment, personal characteristics, social information, and the cognitive construction of reality (see Figure 3). Attempts to change objective reality (i.e., the physical and social environment, personal characteristics) have been labeled problem-focused coping (Lazarus & Folkman, 1984; Moos & Billings, 1982). Attempts to change social information include challenging sources of social information, deemphasizing negative information, or seeking new sources of information. These attempts are illustrated when employees seek social information that minimizes negative performance feedback (Larson, 1989). Finally, efforts to cognitively reconstruct reality may involve repressing, distorting, or denying undesirable aspects of the situation (French et al., 1982; Lazarus, 1983), or modifying previously constructed perceptions that had created stress.

A second mechanism by which coping may influence stress is by adjusting desires to conform with perceptions, thereby resolving the discrep-

ancy (Beehr & Newman, 1978; Campion & Lord, 1982; French et al., 1982; Hamner et al., 1978; Pearlin, Lieberman, Menaghan, & Mullan, 1981; Strauss, 1974; Taylor et al., 1984). A third mechanism is to reduce the importance associated with the discrepancy, making it less central to overall well-being (Lazarus & Folkman, 1984; Pearlin et al., 1981; Schuler, 1985; Sherwood, 1965). Coping by altering desires or importance has been labeled appraisal-focused coping (Moos & Billings, 1982) and defense (French et al., 1982; House, 1974). In general, these forms of coping will occur less frequently than coping by changing perceptions (Campion & Lord, 1982; Taylor et al., 1984), but their frequency will increase when the perceived efficacy of changing perceptions is low (Klinger, 1975; Scheier & Carver, 1988), when previous efforts to change perceptions have failed (Campion & Lord, 1982; Hollenbeck, 1989; Klein, 1989), or when importance associated with the discrepancy is relatively low (Taylor et al., 1984).

Finally, coping may entail attempts to improve well-being directly, using methods that influence well-being independent of psychological stress. Some of these methods, such as relaxation and medication, tend to improve overall well-being (Newman & Beehr, 1979), while others, such as smoking and alcohol consumption, may improve psychological well-being but damage physical well-being. These methods have been labeled emotion-focused coping (Lazarus & Folkman, 1984) and Class II coping (Kahn et al., 1964). This form of coping is more likely when stressful discrepancies seem unresolvable, or when previous attempts to change perceptions, desires, and importance have failed (Lazarus & Folkman, 1984).

As indicated in Figure 3, personal and situational factors moderate the effects of discrepancies on coping and the effects of coping on the determinants of stress (House, 1974; Kahn et al., 1964; Newman & Beehr, 1979). Personal factors that moderate the effects of discrepancies on coping include persistent tendencies to cope in certain ways. For example, an employee with an internal locus of control may be more likely to direct coping efforts toward the situation (Cohen & Edwards, 1989). Situational factors that moderate the effects of discrepancies include the availability of social support (Cohen, 1988; House, 1981) and opportunities or constraints to cope in certain ways, such as organizational policies that prevent changing unattainable performance goals. Personal factors that moderate the effects of coping on the determinants of stress include skills and abilities relevant for successful coping. As indicated previously, when employee abilities meet the demands of the coping strategy in use, successful coping is more likely. Situational factors that moderate the effects of coping include organizational policies and powerful others that may facilitate or hinder coping success (cf. Porter & Lawler, 1968).

Multidimensional Aspects of the Model

The preceding discussion has focused primarily on the components of a single feedback loop. However, the present theory posits that perceptions and desires are compared over a wide variety of job facets, and these

comparisons combine to produce the total amount of experienced stress (cf. Rice et al., 1985). Furthermore, the more time an employee spends thinking about a particular discrepancy, the greater impact that discrepancy will have on total stress. It follows that total stress depends upon the number, size, and importance of discrepancies, as well as the *duration* of each discrepancy, meaning *the amount of time the employee spends thinking about the discrepancy* (Beehr & Bhagat, 1985, Higgins, Bond, Klein, & Strauman, 1986, Lazarus & Folkman, 1984). Similar to importance, duration moderates the effects of discrepancies on outcomes (Carver & Scheier, 1981; Gardner et al., 1987, Hollenbeck, 1989). For instance, if an employee constantly dwells on a negative relationship with a supervisor, then total stress will be determined primarily by this single discrepancy rather than an equally weighted sum of all perceived discrepancies. The duration of a given discrepancy will be higher when its importance is high, its magnitude is particularly large, or its resolution is uncertain, thereby suspending coping strategies that would either eliminate the discrepancy or remove it from subjective awareness (Beehr & Bhagat, 1985, Klein, 1989; Lord & Hanges, 1987; Schuler, 1980, 1985, Taylor et al., 1984).

Though some discrepancies may contribute independently to overall stress, others are functionally related, such that resolving one discrepancy may eliminate or exacerbate another (Johnson, Maruyama, Johnson, Nelson, & Skon, 1981). For example, fulfilling a sales quota may yield a desired bonus, such that resolving the former discrepancy helps resolve the latter (Vroom, 1964). Conversely, satisfying the mandates of one superior may violate those of another, making it impossible to simultaneously resolve both discrepancies (Taylor et al., 1984). These relationships underlie role conflict (Kahn et al., 1964) and have been used to explain the different functional forms for discrepancies involving minima, maxima, optima, and ranges of acceptability (French et al., 1982, Kulka, 1979).

Relationships among feedback loops also may operate hierarchically (Carver & Scheier, 1981, 1982, Powers, 1973, Simon, 1967). Through this hierarchy, superordinate loops activate discrepancies in subordinate loops, and resolving discrepancies at subordinate levels helps to resolve discrepancies at superordinate levels (Lord & Hanges, 1987). Powers (1973) distinguished nine levels in this hierarchy. At the top is the system level, which focuses on discrepancies between the self-image and the ideal self. Next is the principle level, where perceptions are evaluated against general guiding principles such as regular work attendance, fulfilling role requirements, and so on. Below this is the program level, where events and behaviors are evaluated and controlled according to logical sequences (Schank & Abelson, 1977). Lower levels, which primarily involve sensory perception and muscular coordination, rarely require conscious attention (Powers, 1973) and, therefore, contribute little to psychological stress. Thus, stress results primarily from discrepancies at the system, principle, and program levels, and the balance of attention allocated to these levels dictates their relative contribution to total stress. Typically, attention is directed toward the pro-

gram level, where most discrepancies are processed and coping strategies are controlled (Carver & Scheier, 1981; Klein, 1989). However, when coping is interrupted, attention may shift to higher levels, where expectancies are reassessed and coping strategies are reinitiated, modified, or abandoned (Klinger, 1975).

There are two primary mechanisms by which superordinate loops may activate subordinate loops. First, a superordinate loop may change the desired level associated with a subordinate loop, creating a discrepancy (Carver & Scheier, 1981; Powers, 1973). Second, a superordinate loop may increase the importance associated with a discrepancy in a subordinate loop. In either case, the result is a negative impact on well-being and the activation of coping, which is intended to reduce stress at the subordinate level and, hence, at the superordinate level. Unfortunately, like other applications of cybernetics, this theory does not adequately explain how desires and importance are activated at the most superordinate (i.e., system) level, though increased self-focus and social cues are potential explanations (Carver & Scheier, 1981, Lord & Hanges, 1987)

Summary

The present theory defines stress as a discrepancy between an employee's perceived state and desired state, provided that this discrepancy is considered important by the employee. Stress damages psychological and physical well-being and activates coping, defined as attempts to reduce the negative impacts of stress on well-being. Coping influences stress by altering the perceptions, desires, and importance constituting the stressful discrepancy and by improving well-being directly. Total experienced stress is determined by the combined effects of multiple discrepancies, with larger effects for discrepancies of longer duration. Discrepancies are often interrelated, both hierarchically and at the same level, such that changes in one discrepancy may resolve or exacerbate others. Thus, the stress and coping process is viewed as a dynamic system of interrelated negative feedback loops, in which multiple discrepancies between perceptions and desires damage well-being and activate coping, and changes in the magnitude of one discrepancy influence the magnitude and/or the importance of others.

The major propositions derived from this theory are presented in Table 1. Many of these propositions reflect the cybernetic properties of the theory, such as the effects of coping on stress, relationships among multiple feedback loops, and focus of attention. Though many of these propositions follow logically from the OS literature, only those involving the effects of discrepancies on well-being have been extensively examined (Edwards, 1991). By explicitly stating these propositions, it is hoped that future OS research, based on either this theory or those reviewed earlier, will directly test the cybernetic mechanisms underlying the stress and coping process, thereby increasing the correspondence between empirical and theoretical OS research.

TABLE 1
Propositions Derived from the Present Theory

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- 1 The impacts of social information on perceptions will be greater when physical evidence is lacking, when social cues are salient, or when the sources of social information are considered credible or similar to the employee
 - 2 The impacts of the cognitive construction of reality on perceptions will be greater when environmental, personal, and social information is ambiguous or unavailable
 - 3 When perceptions fall short of minima, exceed maxima, or deviate from optima or ranges of acceptability, well-being will worsen, and coping mechanisms will be activated
 - 4 The comparison of perceptions to desires will become more conscious with increases in self-focus, attention directed toward desires, situation novelty, discrepancy magnitude, discrepancy importance, or cues from others that conscious comparison is desirable or appropriate
 - 5 The comparison of perceptions to desires will become more frequent with increases in self-focus, uncertainty regarding discrepancy resolution, or discrepancy importance
 - 6 As discrepancy importance increases, the effects of the discrepancy on well-being and coping will become stronger
 - 7 The process of generating, evaluating, and selecting coping strategies will become more conscious with increases in discrepancy magnitude, discrepancy importance, situation novelty, and coping difficulty
 - 8 Coping will influence well-being both directly and indirectly, by altering either the perceptions and desires involved in the discrepancy and/or the amount of importance associated with the discrepancy
 - 9 Coping by changing desires or importance will become more likely with decreases in the perceived efficacy of changing perceptions, previous failures to change perceptions, or decreases in discrepancy importance
 - 10 Coping by directly improving well-being will increase when efforts to change perceptions, desires, and importance have either failed or seem unlikely to succeed
 - 11 As duration increases, the effects of the discrepancy between perceptions and desires on coping and well-being will become stronger
 - 12 As either discrepancy magnitude or importance increases, duration will increase
 - 13 When resolving a given discrepancy will exacerbate another discrepancy, coping efforts will decrease, and well-being will worsen
 - 14 As the magnitude of the discrepancy associated with a superordinate loop increases, the magnitudes of the discrepancies associated with its subordinate loops will also increase
 - 15 As the importance of the discrepancy associated with a superordinate loop increases, the importance of the discrepancies associated with its subordinate loops will also increase
 - 16 When coping is interrupted, attention will shift from the program level to higher levels
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RELATIONSHIP WITH EXISTING OS THEORIES

The theory presented here has attempted to resolve the five major inconsistencies associated with the theories reviewed earlier, while incorporating and extending their primary conceptual strengths. First, the present theory emphasizes that stress involves the comparison of perceptions to desires (Beehr & Newman, 1978; Cummings & Cooper, 1979, French et al., 1982), and that comparisons of demands to abilities predict coping efficacy (Harrison, 1978). Second, it includes both well-being and coping as out-

comes of stress (Beehr & Newman, 1978; French et al., 1982; Kahn et al., 1964; Lazarus & Folkman, 1984). Third, it posits that stress may activate coping both directly (Cummings & Cooper, 1979; Kahn et al., 1964, Lazarus & Folkman, 1984; McGrath, 1976) and indirectly, through well-being (Beehr & Newman, 1978; French et al., 1982). Fourth, it indicates that coping may influence both the person and the environment (Beehr & Newman, 1978; French et al., 1982; Kahn et al., 1964, Lazarus & Folkman, 1984). Finally, it incorporates multiple interrelated feedback loops arranged in a hierarchical system (Cummings & Cooper, 1979, Lazarus & Folkman, 1984; McGrath, 1976).

The preceding discussion may imply that the present theory generates few propositions that, taken separately, are novel or unique. Such an objective would be formidable, given that the present theory has drawn extensively from a sizable literature. However, an important contribution of this theory is that it integrates these propositions within a single, coherent framework, explicitly states them in a testable form, and describes methods for their investigation. This combination provides a unified framework for studying stress, coping, and well-being in organizations and establishes a foundation for examining processes that have been largely overlooked in the OS literature, such as feedback mechanisms and relationships among multiple feedback loops. By examining these processes, empirical OS research will move beyond tests of simple recursive models that have dominated the field since its inception.

METHODOLOGICAL ISSUES IN TESTING THE PROPOSED THEORY

As indicated previously, the lack of correspondence between theoretical and empirical OS research may be partly attributable to methodological issues in studying cybernetic processes. These issues are discussed in the next section, which focuses on design, measurement, and analysis. More general discussions of methodological issues in OS research are available elsewhere (e.g., Kasl & Cooper, 1987, Mackay & Cooper, 1987; McGrath, 1970).

Design

A critical decision in examining cybernetic processes is whether to use a cross-sectional or longitudinal design. This decision not only has obvious implications for causal inference, but also reflects important theoretical assumptions regarding the operation of the underlying cybernetic processes. A cross-sectional design implies that these processes have reached a state of equilibrium, meaning that all components of the model have stabilized. This may occur with chronic stress, where adverse working conditions have enduring negative effects on well-being and require sustained coping efforts. However, many sources of stress are acute rather than chronic (e.g., layoff, job change, reorganization), and stress, coping, and well-being typically vary during such episodes (Folkman & Lazarus, 1985; Lazarus & Lau-

nier, 1978). Furthermore, longitudinal designs can detect whether the underlying processes have, in fact, stabilized, as assumed with cross-sectional designs. For these reasons, longitudinal designs are generally preferred for studying cybernetic stress processes.

Two important issues should be considered when designing longitudinal studies of cybernetic stress processes. First, though cybernetic processes imply a series of sequential relationships, such that stress at time 1 influences well-being and elicits coping at time 2, which influences stress at time 3, all model components should nonetheless be measured at each time interval. This way, the hypothesized causal ordering can be tested against competing causal flows. Second, the time lag between measurements must coincide with the underlying processes. For acute sources of stress and transient shifts in affect, these processes may operate very rapidly, whereas for chronic sources of stress and the development of long-term, degenerative disease, these processes may take years to cycle. Furthermore, several different time lags may be necessary when the relationships between multiple feedback loops are examined, because higher level loops may operate more slowly than lower level loops (Carver & Scheier, 1981). These considerations should not be taken lightly, because an inappropriate time lag can bias parameter estimates, particularly when model components change rapidly (Kessler, 1987).

Measurement

Although numerous constructs have been implicated in the present theory, the following discussion will focus primarily on the measurement of its core components (i.e., stress, coping, and well-being). As suggested by its definition, the operationalization of stress requires the measurement of perceptions, desires, and importance associated with a specific condition or state. Obviously, these measures must be commensurate, such that they refer to the same content dimension (Caplan, 1987; French et al., 1982; Graham, 1976; Lewin, 1951). For example, an employee may be asked to report perceived and desired amounts of job complexity, along with the importance associated with job complexity. Commensurate measures are widespread in studies of person-job fit (Edwards, 1991), and their superiority over noncommensurate measures has been demonstrated empirically (Cherrington & England, 1980).

An important decision in designing commensurate measures is whether to use content dimensions based on characteristics of the employee or the work environment. The former approach typically involves adapting measures of work values (usually operationalized in terms of importance) to include measures of perceptions and desires of factors pertaining to those values (e.g., Betz, 1984; Payne, 1970; Porter & Lawler, 1968). In the latter approach, measures of perceived work attributes are adapted to include measures of desires and importance associated with those attributes (e.g., Cherrington & England, 1980; French et al., 1982; O'Brien & Dowling, 1980; Wanous & Lawler, 1972). The present author has successfully used both

approaches, the former based on the Work Aspect Preference Scale (WAPS; Pryor, 1983), and the latter based on the Leader Observation System (LOS; Luthans & Lockwood, 1984). The choice between these approaches primarily depends upon whether the purpose of the study requires a comprehensive representation of the employee or the work environment. However, the former approach is usually preferred for studying hierarchical cybernetic processes, because these processes presumably operate through the value structure of the employee.

It should be noted that the procedure described here does not recommend a measure of the discrepancy itself. Historically, discrepancies such as these have been operationalized as the raw or transformed difference between measures of the employee and the work environment (Edwards, 1991). It is widely known that difference scores present numerous substantive and methodological problems (Cronbach & Furby, 1970; Johns, 1981; Wall & Payne, 1973), and superior procedures are available that use separate measures of the employee and work environment, supplemented by higher order and interactive terms (Edwards, 1991, *In press*; Edwards & Cooper, 1990). Some investigators have attempted to avoid problems with difference scores by using items that directly compare the employee and work environment (e.g., Cook & Wall, 1980; Greenhaus, Seidel, & Marinis, 1983; Hollenbeck, 1989; McFarlin & Rice, *In press*; Michalos, 1980, 1983; Rice, McFarlin, & Bennett, 1989; Tziner & Falbe, 1990), but these measures fail to convincingly avoid these problems and, in fact, introduce additional problems (Edwards, 1991, *In press*).

Aside from general issues regarding the measurement of well-being in OS research (e.g., Balick & Herd, 1987; Fleming & Baum, 1987; Fried, Rowland, & Ferris, 1984; Meier, 1991; Pennebaker & Watson, 1988; Warr, 1990), two additional issues pertaining to tests of cybernetic models should be considered. First, as mentioned previously, dimensions of well-being require different lengths of time to manifest and dissipate, and the dimension chosen should be consistent with the time lag of the research design. Second, measures of affect should be commensurate with measures of perceptions, desires, and importance. For example, responses to stress associated with workload should be measured in terms of affect (e.g., tension, satisfaction) associated specifically with workload. Commensurate measurement is not logically possible for general psychological disturbance or physical well-being, but the effects of stress on these outcomes may be mediated by changes in commensurate affect (French et al., 1982; Lazarus & Folkman, 1984; Matteson & Ivancevich, 1979). These mediating effects may be examined empirically by including measures of all relevant well-being outcomes.

The measurement of cybernetic coping processes raises two important issues (for general discussions, see Cohen, 1987; Lazarus & Folkman, 1984). First, coping should be operationalized specifically in terms of efforts to change the components of the model (i.e., perceptions and its determinants, desires, importance, duration, and well-being). Though numerous coping

measures are available (e.g., Dewe & Guest, 1990; Folkman & Lazarus, 1980; Hall, 1972; Latack, 1986; Newton & Keenan, 1985), many were derived empirically, based on either open-ended accounts of coping behaviors or exploratory factor analysis. Such measures often omit theoretically relevant coping dimensions or confound conceptually distinct dimensions at the item or scale level (Carver, Scheier, & Weintraub, 1989). Edwards and Baglioni (In press) present an alternative measure that specifically taps efforts to change perceptions, desires, and importance, as well as attempts to lower duration (i.e., avoid thinking about the situation) and improve well-being. Second, measures of coping should be commensurate with measures of the components of stress. For example, if stress involves a discrepancy between perceived and desired job complexity, coping should be measured in terms of efforts to change perceived job complexity, desired job complexity, the importance of job complexity, and so on.

A complete discussion of the measurement of all constructs pertaining to the proposed theory is beyond the scope of this article. Nonetheless, to facilitate future research, measures of the remaining key constructs are suggested. Numerous measures of objective job and employee characteristics are available, the former based on job analysis (Harvey, Friedman, Hakel, & Cornelius, 1988; McCormick, 1979), and the latter based on personality assessment (Bernardin & Bownas, 1985; Lanyon, 1984). Social information is typically operationalized as statements made by others (Zalesny & Ford, 1990), and the cognitive construction of reality has been operationalized as the reliance on schematic information (e.g., scripts) in event recall (Cellar & Barrett, 1987; Cellar & Wade, 1988; Foti & Lord, 1987). Duration may be operationalized as focus of attention, meaning the amount of time the employee thinks about various organizational aspects (Gardner, Dunham, Cummings, & Pierce, 1989). Finally, automaticity of cognitive processing has been measured using process tracing methods, such as information boards and verbal protocol analysis (Ford, Schmitt, Schechtman, Hults, & Doherty, 1989; Payne, 1976; Schweiger, 1983). The present author has developed a computerized information board similar to that described by Johnson, Payne, and Bettman (1988) to examine the evaluation and selection of coping strategies.

Analysis

There are two general strategies for analyzing data from cybernetic OS studies, depending on whether the design is cross-sectional or longitudinal. Cross-sectional designs require nonrecursive modeling, which provides parameter estimates for models with reciprocal effects (Berry, 1984; Schaubroeck, 1990). For identification, each variable involved in a reciprocal relationship must have an instrument (i.e., a variable that affects only one variable in the reciprocal relationship is unrelated to any unmeasured causes of the other variable, and is not caused by either of the reciprocally related variables) (Duncan, 1975; James & Singh, 1978; Kenny, 1979). Once instruments are selected, the model may be estimated using two-stage least

squares (James & Singh, 1978) or structural equations modeling (Anderson & Gerbing, 1988; Duncan, 1975; James, Mulaik, & Brett, 1982; Long, 1983), both of which can be implemented using LISREL (Joreskog & Sorbom, 1988).

It should be noted that none of the models in Figures 1, 2, or 3 are identified as presented, and if a cross-sectional design is used, instruments must be added. For example, exogenous variables such as decisions from corporate levels or economic conditions may classify as instruments for the work environment. Similarly, socialization experiences may serve as instruments for employee desires, and coping styles (e.g., repression, minimization, vigilance) may serve as instruments for coping behaviors. These variables should be chosen carefully because they must meet rather stringent requirements (James & Singh, 1978).

Data from longitudinal designs should be analyzed using cyclical recursive modeling, a variation of repeated measures analysis in which X_1 at time 1 affects X_2 at time 2, which affects X_1 at time 3, and so on (Billings & Wroten, 1978). Because repeated measures analysis has been discussed extensively (Cook & Campbell, 1979; Duncan, 1972; Dwyer, 1983; Kenny, 1975; Kessler, 1987; Pedhazur, 1982), only three particularly important issues are mentioned here. First, errors for repeated measures of the same variable are usually correlated, and parameters representing these correlations should be included in the model (Dwyer, 1983). Second, longitudinal research often yields missing data due to attrition, although solutions to this problem have been proposed (Kessler, 1987; Marini, Olsen, & Rubin, 1980). Finally, longitudinal studies do not establish causality, but simply rule out certain spurious alternatives (Dwyer, 1983; Kenny, 1975). Even though true randomized experiments certainly can establish causality more conclusively, they are often impractical or unethical for OS research (Kessler, 1987; Lazarus & Folkman, 1984; McGrath, 1970), making careful longitudinal research the most viable recourse.

Analyses of cybernetic stress processes are further complicated for relationships among multiple feedback loops. Relationships between loops at the same level may be examined by adding parameters linking their respective perceptions and desires. Similarly, the hierarchical effects of superordinate loops may be represented by linking perceptions and desires in the superordinate loop to desires and importance in the subordinate loop. Again, these analyses should use separate measures of perceptions and desires, not indexes intended to represent their discrepancy (Edwards, 1991, *In press*, Edwards & Cooper, 1990)

Examples in the Literature

This article was motivated in part by the lack of empirical studies of cybernetic stress processes. Even studies based on cybernetic models (e.g., Frone & McFarlin, 1989) rarely examine feedback or hierarchical effects. Nonetheless, some studies provide evidence bearing on certain aspects of the proposed model. For example, numerous studies have found a negative relationship between well-being and the discrepancy between perceptions

and desires (Edwards, 1991; Michalos, 1986). However, most of these studies have used difference scores to represent the discrepancy and, hence, are flawed (Edwards, In press).

Several studies have examined the relationship between discrepancies and coping (e.g., Caplan, Naidu, & Tripathi, 1984; Lang & Markowitz, 1986; Latack, 1984; Leiter, 1991; Mayes & Ganster, 1988), but these studies are predominantly cross-sectional, making it impossible to determine whether the discrepancy stimulated coping, coping influenced the discrepancy, or both (Menaghan & Merves, 1984). Many studies have examined the effects of coping on well-being (Edwards, Baglioni, & Cooper, 1990), but few have examined its effects on the source of stress (Menaghan, 1983). Exceptions include Folkman, Lazarus, Dunkel-Schetter, DeLongis, and Gruen (1986), who examined the relationship between coping and the degree to which a stressful encounter was "resolved," and Anderson, Hellreigel, and Slocum (1977), who examined the effects of coping among small business managers on economic recovery following flood damage. Unfortunately, neither of these studies used commensurate measures of coping and the sources of stress, making it difficult to ascertain the operation of cybernetic processes. In contrast, Menaghan and Merves (1984) reported a panel study examining the relationship between stress and coping at time 1, followed by the relationship between coping at time 1 and stress at time 2. Other studies have examined specific aspects of the cybernetic model, such as the moderating effects of focus of attention on the relationship between discrepancies and well-being (Frone & McFarlin, 1989; Hollenbeck, 1989) and hierarchical value structures (Bolton, 1980; Gati, 1991; Lofquist & Dawis, 1978; Pryor, 1987). Michalos (1980, 1983) examined relationships between multiple discrepancies, but these discrepancies were operationalized using single indexes rather than their separate components, thereby introducing the substantive and methodological problems mentioned earlier (Edwards, In press).

The preceding examples illustrate the paucity of studies examining cybernetic stress and coping processes in their full form. The study by Menaghan and Merves (1984) provides a partial test of a cyclical recursive model, but no studies were found that examined the effects of coping on specific components of the discrepancy or the relationships among multiple feedback loops. This further reinforces the assertion that the cybernetic processes evident in current OS theories have been largely overlooked in empirical OS research and that an integrative cybernetic theory of stress, supplemented by propositions and appropriate methodology, is clearly needed.

DO WE REALLY NEED ANOTHER THEORY OF STRESS IN ORGANIZATIONS?

Given the substantial number of theories available in the OS literature, it is natural to question whether yet another theory will solve the problems

that plague this literature. Though the rationale for the proposed theory has been emphasized throughout this article, it is reiterated here. First, the paucity of empirical research examining cybernetic processes embedded in current OS theories indicates an implicit rejection of these processes, the absence of specific propositions describing these processes, methodological difficulties, or some combination of these factors. This article has described the conceptual rationale for the cybernetic processes in the proposed theory, specific propositions regarding these processes, and appropriate methodology. This combination should facilitate future empirical research that closely corresponds to the proposed theory. Second, although current OS theories share certain general similarities, such as feedback mechanisms and the match between the employee and the work environment, they are inconsistent in many important areas. The proposed theory attempts to resolve these inconsistencies while preserving the major strengths of these theories. Third, the current application of cybernetics to diverse phenomena suggests the appealing possibility of developing more general and parsimonious frameworks for studying human behavior. Up to this point, no OS theory has fully applied the principles of cybernetics. The proposed theory fills this gap, thereby including OS research in the integrative possibilities offered by cybernetics.

LIMITATIONS AND AREAS FOR FURTHER DEVELOPMENT

The present theory contains three primary limitations. First, it focuses on the influence of cognitive processes on well-being, with less emphasis on the effects of health-related behaviors, such as diet, smoking, and exercise. Second, it presumes at least some minimal level of conscious cognitive processing, both in comparing perceptions to desires and in selecting and implementing coping strategies. Therefore, it does not attempt to explain emotional responses that may occur without prior cognitive processing (Zajonc, 1980). Third, it focuses on cognitive processes as precursors of well-being and, hence, does not adequately explain physiological responses that are assigned meaning post hoc (Schachter & Singer, 1962).

Despite these limitations, this theory suggests several important opportunities for further development. First, by incorporating the cognitive construction of reality, it suggests the study of *imaginary* sources of stress, (i.e., potential situations or events that never occur, but which nonetheless generate worry and tension). Second, by including positive discrepancies (i.e., situations where perceptions exceed desires), it incorporates the potential beneficial effects of positive psychological states on well-being (Edwards & Cooper, 1988; Karasek et al., 1982; Seeman, 1989). Third, by incorporating causal relations among multiple feedback loops, particularly where the resolution of one discrepancy exacerbates another, it provides a tentative explanation for chronic stress in the presence of seemingly viable coping alternatives (Baumeister & Scher, 1988).

SUMMARY AND CONCLUSION

This article has presented a cybernetic theory of stress, coping, and well-being in organizations. This theory integrates and extends existing OS theories, particularly those that propose feedback mechanisms, by resolving their inconsistencies and building on their strengths, primarily through the comprehensive application of principles from cybernetic theory. The proposed theory is accompanied by a set of propositions that emphasize its core mechanisms, particularly the operation of cybernetic processes, and by an overview of methodological issues involved in examining these processes. Hence, the present theory provides a unifying framework for the study of stress, coping, and well-being in organizations and establishes a basis for its empirical investigation. It is hoped that this will begin to rectify the current lack of correspondence between theoretical and empirical OS research, thereby contributing to the accumulation of knowledge in this important area of investigation.

The present theory also highlights the general applicability of cybernetics, or control theory, to the study of behavior in organizations. This unifying framework provides a mechanism for integrating traditionally separate areas of investigation, such as stress, motivation, absenteeism, self-leadership, performance appraisal, and goal setting, thereby facilitating the accumulation of knowledge at a more general level in the field of organizational behavior.

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